



MADRAS GOVERNMENT MUSEUM

**GUIDE TO
THE PRINCIPAL EXHIBITS IN
THE GOVERNMENT MUSEUM,
PUDUKKOTTAI**

BY

M. S. CHANDRASEKHAR, B.Sc., F.B.S.,
Curator, Government Museum, Madras



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1966

PRINTED AT SUPER POWER PRESS, MADRAS
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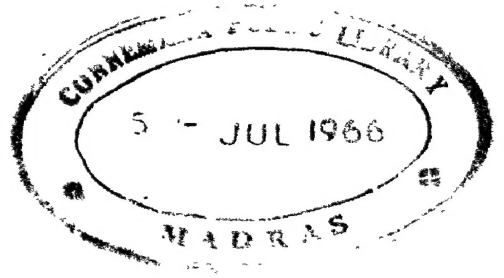
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PREFACE

The "museum movement" has been gathering considerable momentum in recent years, and the current trend in Museums all over the world is to lay increasing emphasis on its role as a vital instrument in popular education. In the present context, therefore, the publication of popular guide books to interpret the collections of the Museum to the lay public has assumed considerable importance as one of the major functions of the Museum. Liberal grants from the Ministry of Education, Government of India have facilitated in no small measure the implementation of a comprehensive publication programme which has been undertaken by this Museum.

It must be admitted that in the course of compiling this book, the author had to race against time and overcome several administrative and financial hurdles. Nevertheless, he has endeavoured to cater to the visitors' convenience, and has so compiled this book as to enable them to use it with advantage while going round the galleries. The book is therefore divided into three parts, the first pointing out what is where, the second dealing only with the exhibits pertaining to the natural sciences, and the third dealing only with the exhibits pertaining to the humanities. The popular grouping or classification of some of the widely divergent exhibits in Part III, is novel, no doubt, but calculated to appeal to the interests of the lay masses, which should be kept sustained.

A guide-book, like this, serves the three-fold function of drawing the attention of the visitors to the exhibits and making the exhibits understood, thereby aiding education. Description of the minute details of all the exhibits, will lead the visitors who are not specialists in all the subjects, to the realms of boredom. An elementary and popular description of a few exhibits, on the other hand, will facilitate a quick and easy appreciation of not only the essential features of the museum objects but also the element of variety and aesthetic beauty in the exhibits, and help maintain the visitor's interest. Should his interest be roused so much as to give him a thirst for knowing more about the exhibits, he will do well to consult any good authority on the subject, or to seek the help of the Curator. When this is done, the guide-book has achieved its aim.

Madras.

25th January, 1966. }

S. T. SATYAMURTI,
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PART I

HINTS FOR THE VISITOR

The establishment of a museum at "Ananda Bagh" in Pudukkottai was first proposed as early as 1896. No development, however, followed the proposal till 1909, when a decision to locate the proposed museum in the "Small Palace" in the main street of Thirugokarnam, Pudukkottai, was taken. This decision was implemented and the Museum was organized and opened to the public in the year, 1910. It has long been realized that the building in which the Museum is housed, is the least suitable for the purpose, and considerable improvements have been made to it in the years, 1934 and 1937, and again in the recent fifties. There yet remains much to be achieved, however, in this regard.

The building is by no means a yard stick to measure the contents inside. For this Museum illustrates all the Museum subjects, and is really a multipurpose museum of a little more than a "regional character." It consists of as many as nine Sections, viz., Geology, Zoology, Economic Products, Pictures and Paintings, Numismatics, Art and Industries, Anthropology, Historical Records and Archaeology. } All these Sections are comprehensively represented, some of them fairly exhaustively too. Description of each and every exhibit is therefore beyond the scope of this small Guide. Moreover the object of this Guide is not to obviate a visit to the Museum, but to induce the visitor to take more interest in the educational exhibits. This task is best achieved, it is hoped, by focussing the visitor's attention only on the principal exhibits. For more detailed information the visitor is requested to consult the Museum Library, for which the facilities can be had from the Curator of the Museum.

To make the best use of this Guide, a Plan of the Museum, is presented on page 2, and the different apartments which concern the visitor are numbered off and detailed below for his information and reference to the appropriate pages.

The visitor climbs up a small flight of steps (marked 1 in the Plan) and passing through the front verandah (marked 2), enters an oblong hall (marked 3) which extends from left to right. This hall houses the Geology Section and a part of the Pictures and Paintings Section. An account of the former is furnished on page 5, and that of the latter on page 72. The hall has three outlets, one leading to the Technical Assistant's room (marked 4), one to the Office room (marked 5) and the third to the inner verandah (marked 6). The Technical Assistant's room contains at present a part of the collections of the Numismatics

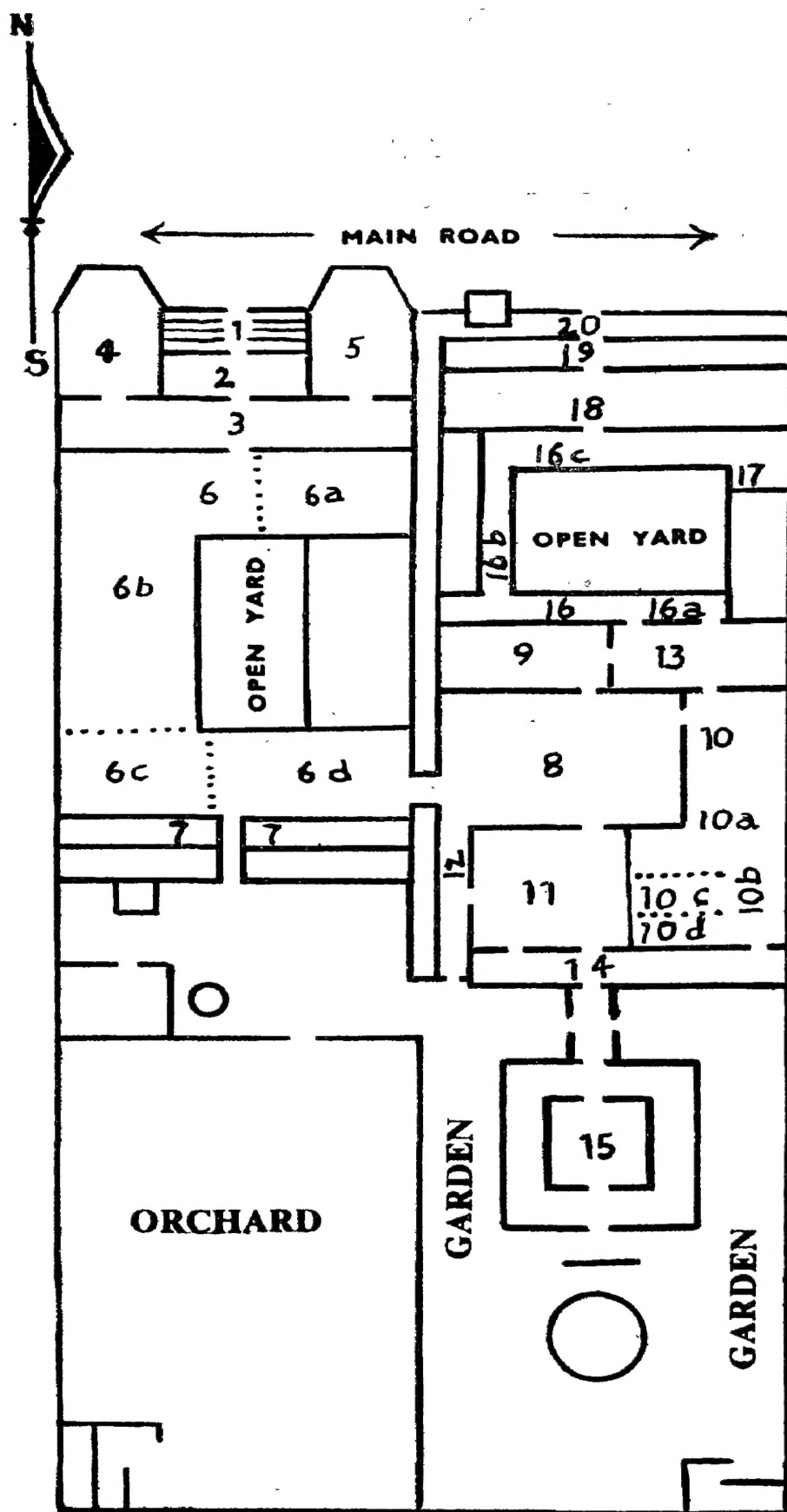


Fig. 1. PLAN OF THE MUSEUM BUILDINGS—NOT TO SCALE.

Section, an account of which is furnished on page 76. It is not necessary for the visitor to enter the Office room, except on business. The verandah (marked 6) behind the Geology Section, is continuous with two other verandahs, all going together to form the three sides of a quadrangular open yard which is closed to the visitor's movements. These three verandahs are divisible into four areas, 6a, 6b, 6c and 6d, as indicated roughly in the Plan. They contain the exhibits belonging to the Zoology Section which is the largest single Section in the Museum, and which occupies also some more portions of the Buildings. The portion marked 6a contains the Arthropoda (page 26); that marked 6b, the Aves (page 40); that marked 6c, the Pisces (page 29); and that marked 6d, the Amphibia (page 34), the Reptilia (page 35), and the Invertebrata other than the Arthropods (pages 18-26). The last-mentioned portion leads on to a big hall (marked 8) on the one hand, and on the other to two rear verandahs (marked 7) which face the garden. The Zoology Section extends into these verandahs and the hall. The hall houses the Mammalia (page 52); and the verandahs house the skeletal remains of a very big whale (page 52). The hall containing the mammalian exhibits, has four outlets, taking the visitor into four rooms (marked 9, 10, 11 and 12 in the Plan). The room 9 is an "annexe," as it were, to the mammalian gallery and houses the skeletons of mammals which have no accommodation in the main gallery. Brief accounts of these skeletons are furnished under Mammalia (page 52). From this "annexe" the visitor may, if he wants to skip the other galleries, enter another room (marked 13 in the Plan) which houses the Historical Records Section (Page 102) and the Inscriptions (page 103). The room 10 is divisible into four parts, 10a containing the Economic Products gallery (page 61), 10b the Jewels and Ornaments gallery (page 92), 10c the Pre-history gallery (page 95) and 10d the Arms and Armour gallery (page 83). The room 11 contains the Art and Industries Section (page 77) besides accommodating "extensions" of the Pictures and Paintings Section (Page 72), the Economic Products Section (page 61), and the Anthropology Section (page 83). The room 12 houses an "extension" of the Pictures and Paintings Section (page 73), and also communicates with the room 11 and the garden. The room 11 opens into a verandah (marked 14) facing the Curator's room (marked 15) and the garden. In this verandah are exhibited the wood-carvings of Pudukkottai (page 82). From this verandah the visitor may enter the Arms and Armour gallery (page 83) in the portion marked 10d, and pass through the Jewels and Ornaments gallery (page 92) in the portion marked 10b, and the Economic Products gallery (page 61) in the portion marked 10a, to the Historical Records gallery (page 102) and the Inscriptions gallery (page 103) in the room 13. From this room 13, begins the Archaeology Section (page 103) which is the second largest Section in the Museum. This room opens into a corridor (marked 16 in the Plan) that is continuous with two other corridors

bounding a (second) quadrangular open yard which is closed to the visitor's movements. These three corridors are marked 16a, 16b and 16c in the Plan. The first two corridors, viz., 16a and 16b, contain Hindu sculptures in stone (page 106), besides a small collection of stone inscriptions (page 105). In the corridor 16c are exhibited not only Hindu but also Jaina sculptures in stone (page 122). The last corridor leads on the one hand to a further extension (marked 17) which ends blindly, and on the other to an oblong hall (marked 18). The blind extension of the corridor 17 contains Jaina sculptures in stone and bronze (page 122). The oblong hall 18 contains Hindu sculptures in stone and bronze (pages 110 and 113), Buddhist sculptures in marble (page 125) and illustrations of temple architecture (page 127). From this hall the visitor steps out to an open verandah (marked 19) that adjoins the exit (marked 20). In the verandah the visitor can see "extensions" of the Sculpture gallery (page 112) and the Arms and Armour gallery (page 90).

PART II

NATURAL HISTORY

Geology Section

As one enters the Museum one steps into an oblong hall which houses the Geology Section and the Pictures and Paintings Section. An account of the exhibits of the latter Section has been furnished elsewhere.

The Geology Section occupies the central part of the oblong hall. The geological collections are small but comprehensive in so far as they present the resources of the Pudukkottai area. Extra-regional specimens are also seen in numbers among the exhibits, which is in consistence with the general principle that the local collections can be best understood only when they are supplemented by those from the other areas. The exhibits in the gallery consist of a few illustrations under General Geology, minerals, rocks and fossils as well as a few charts and photographs.

GENERAL GEOLOGY

All aspects of Geology other than the study of minerals, rocks and fossils, are conveniently referred to, in these pages, as General Geology. Many of the illustrations under this head are presented in the form of charts and photographs.

Among the specimens as such, the most important are the meteorites or heaven stones. These objects travel freely in the inter-planetary space, and when they get nearer the earth's force of gravity, are drawn towards it (earth). They generally get burnt up by the enormous heat generated by the friction in their passage through the atmosphere. If however they happen to be large enough, the un-burnt pieces get embedded in craters that are formed by the impact of their fall on the earth's surface. They are then collected as meteorites. They may be metallic or chondritic (stony). Presence of volcanic minerals in the composition of the latter, suggests their origin in the interior of other planets. Collections in the gallery begin with a couple of such meteoric stones.

MINERALS

Minerals are inorganic substances occurring freely in Nature (either loose on the surface, or deep-seated in the interior, of the earth's crust). They are so important for industrial progress, that the more the country depends on them the more is it said to stride forward. Most minerals are crystalline with definite faces and angles arranged in geometrical

regularity around definite axes. Some of them however are amorphous, either massive or powdery and without any definite form or shape. Crystalline minerals may also occur in combinations known as twins. All minerals have a certain amount of hardness, to measure which Mohs has introduced an arbitrary scale. Crystalline minerals split only among certain definite planes, parallel to crystal faces, which property is known as cleavage. All minerals do not show good cleavage, but most of them (even amorphous ones) break without any relation to cleavage planes. The way they break is known as fracture which varies with the kind of mineral.

A mineral when rubbed against an unglazed porcelain plate may or may not leave a powder on the plate. The colour of the powder known as the streak, helps identification of the mineral.

Minerals have got also peculiar optical properties. Some of them may appear to be of one colour when seen under visible light, and of a different colour when seen under ultra-violet light. Some minerals may allow light to pass through them without absorption, others may absorb light partially or fully, and yet others may reflect it partially or fully. Some minerals may absorb, reflect or refract light in such a way as to produce a peculiar lustre.

While some minerals are magnetic, and some others become so when heated, many are non-magnetic.

A few minerals are endowed with electrical properties, too. Some can control radio frequencies, and others develop electric charge when rubbed or heated.

Some minerals show radio-activity and they are in great demand today, although little known in the past.

Since, as already stated, minerals are but inorganic compounds, they are classified according to their chemical composition. The collections in the Museum are quite comprehensive and represent many classes of minerals. Eleven of Dana's seventeen classes of minerals are represented in the gallery. The more important ones among them are detailed below.

Elements

Some elements occur in Nature as pure and solid forms, without entering into any chemical composition with other elements. The former elements are also treated as minerals. They may be metallic or non-metallic. The specimens include gold and graphite.

Gold is too widely known and popular to need any elaborate account. It is found sometimes associated with quartz rocks

(particularly blue quartz of Mysore). In the gallery it is seen as small specks on a few quartz specimens (including blue quartz).

Graphite is another mineral which is an element (carbon), occurring in free state in Nature. It is slightly flexible and typically greasy to the feel. It is one of the softest of minerals. Its most common application is as "lead" in lead-pencils. It is a good industrial lubricant. Its importance has gone up very high, in recent years, as one of the moderators to control neutrons in atomic piles.

A specimen of meteoric iron in the gallery, can perhaps be included in this class. An account of the origin of meteoric iron is given under General Geology. The meteoric iron is malleable like the terrestrial iron, and can make good cutting and other instruments.

Haloids

Haloids are represented in the gallery only by fluorspar. It is a fluoride of Calcium and the only common mineral to contain and supply the gaseous element, Fluorine. It is crystalline and belongs to the Cubic System. It varies widely in colour, the colourless ones being rare.

Sulphides

Chalcocite is a sulphide of copper, usually occurring in vein deposits. It is a dark, heavy mineral and rarely occurs as crystals.

Galena is a sulphide of lead. It is a heavy, brittle and grey mineral crystallising in the Cubic System. It is an important ore for lead.

There are two sulphides of iron, iron pyrite crystallising in the cubic form and Marcasite in the orthorhombic form. Both have the same chemical composition. When tarnished the former glitters like gold and for that reason, is also called the Fool's Gold. Its colour is light yellow, but that of its streak is greenish black. Its chief use is as a raw material for sulphur in the manufacture of sulphuric acid.

Orpiment is a sulphide of Arsenic, occurring generally as a massive form. Specimens are photo-sensitive and turn dull on exposure to light.

Sulpho-salts

Chalcopyrite is the sulphide of copper and iron and the common copper-ore. It is a brassy, almost golden mineral. Though crystals are also seen, massive forms are the common ones in most copper mines.

Bournonite is a sulphantimonite of lead and copper. The mineral is heavy and brittle with a mettalic lustre. Some crystals are said to show such perfect twinning on prism faces, that they sometimes resemble cog-wheels.

Oxides

Quartz is an oxide of Silicon and the commonest of minerals. It is an important constituent of most igneous rocks. Even some sedimentary rocks (eg., sandstone) and some metamorphic rocks (eg., quartzite), are cent per cent quartz. Quartz occurs both as massive forms and as hexagonal crystals. The crystalline forms have vitreous lustre and the

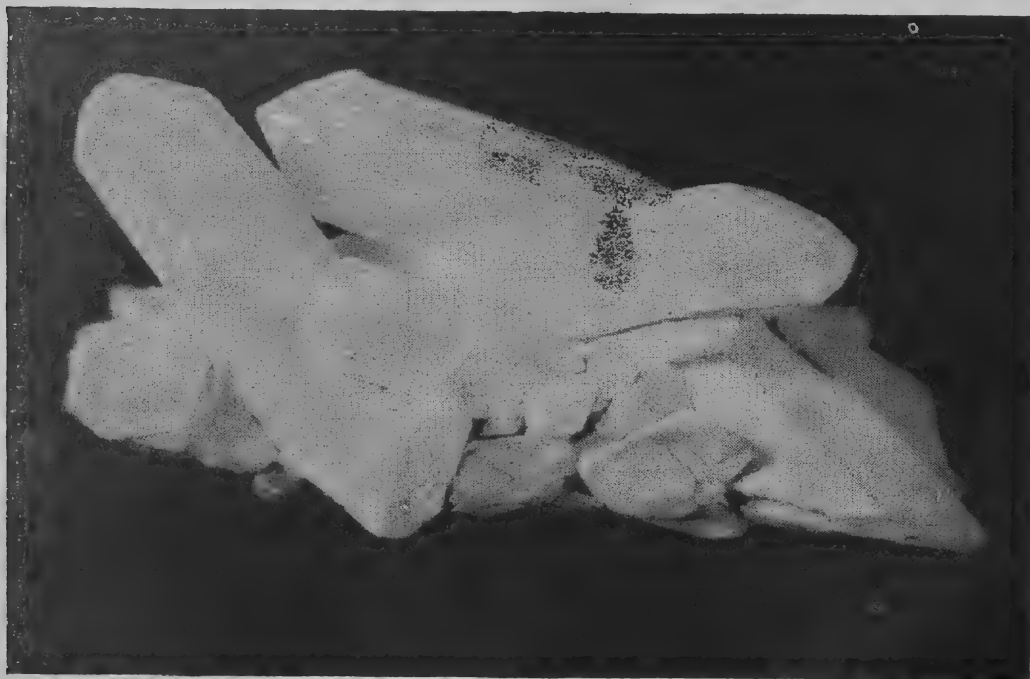


Fig. 2. A NATURAL BUNCH OF CRYSTALS OF QUARTZ

others, waxy lustre. Quartz occurs in various colours, but the general colour is white, although colourless forms are also there. It is brittle and breaks with a typical conchoidal fracture. Some of its varieties are ranked as ornamental stones. Quartz is extensively used in optical, electrical, magnetic and other industries. It is a raw-material for the manufacture of abrasives, glass, porcelain, etc.

Rock-crystal is a colourless, glassy and crystalline variety of quartz. It finds extensive applications in the manufacture of radio, television and radar equipments because of its pyro-electric properties. Inferior specimens are utilised to make lenses and prisms. Illustrations of the stages in the manufacture of such lenses are also exhibited.

A rock-crystal with spangles of mica or of haematite enclosed in it, and having thereby a shimmering lustre, is called *Avanturine*. This mineral is also included in the collections on display.

Smoky quartz is a yellowish, brownish or black crystalline quartz. It is cut and used as a semi-precious stone.

Flint is a grey quartz which breaks with sharp edges. It was much used by the pre-historic man for making tools and striking fire. An impure form of flint is known as chert or hornstone. It may be white, yellow, grey or brown in colour. The grey variety is often used by the cobblers for sharpening their awls.

There is also one specimen of green quartz on display, which owes its colour to enclosed chlorite.

Jasper is an opaque quartz of red or yellow colour. Some specimens are very beautiful.

Chalcedony is the term applied to denote a waxy, smooth form of quartz, apparently massive but really composed of microscopic crystals. It fills cracks or forms crusts. It is usually translucent but sometimes transparent also. Its colours vary widely.

Agate is chalcedony with banded or variegated appearance. The bands may be wavy or parallel. Onyx is a variety of agate with parallel bands of white and black or brown colours.

Carnelian is a translucent red variety of chalcedony. This mineral has been much in use as a semi-precious stone since the pre-historic days.

Corundum is an oxide of aluminium and one of the most commonly occurring minerals. Crystals of this mineral belong to the Hexagonal System, but distorted and massive forms are the most common. Corundum is harder than most other minerals, and chiefly used therefore as an abrasive. The gem varieties supply the rubies and sapphires of commerce.

Haematite is an oxide of iron and the most important iron ore. The mineral is dark, compact and shining, but its streak is cherry-red in colour.

Magnetite is an oxide of iron which can be picked up by a magnet. It is a valuable iron ore and is springing up in importance in South India on account of the setting up of the lignite mines at Neyveli.

Psilomelane is a hydrous oxide of manganese. It is a black amorphous mineral with a sub-metallic lustre. The manganese ore

exhibited in the gallery, is (probably) Psilomelane. A soft, impure mixture with other minerals, known as Wad, is also included in the collections.

Pyrolusite is an oxide of manganese and one of its principal ores. Its hardness varies widely. Pyrolusite occurs also as black crusts which resemble the pattern of fossil ferns along cracks in other rocks. A botryoidal specimen is on display.

Spinel is an oxide of Aluminium and Magnesium and crystallises in the Cubic form. It is brittle and transparent with vitreous lustre and conchoidal fracture. The red variety in the gallery is a gem stone, known as spinel ruby.

Carbonates

Calcite is a carbonate of Calcium. Great masses of calcite occur in limestone, and small crystal pieces in rock-openings. Transparent crystals are rare, and are known as iceland spar. It has the peculiar optical property of bending light in two ways and thereby causing double-refraction. The iceland spar is used in range-finders and polarised microscopes. Most specimens are opaque and variously coloured. Calcite fluoresces well in the ultra-violet light.

Magnesite is a carbonate of Magnesium. It is massive and dull white in colour. It is a refractory material.

Silicates

Felspars are anhydrous silicates found in all igneous rocks and in all other rocks derived from them. They form a big group of minerals. Of them all only the important exhibits are referred to in this book. The Orthoclase felspar which is usually white or flesh-coloured, is the most important as meeting the needs of the porcelain industry. It changes on decomposition into the China-clay of commerce. Moonstone is a bluish sheen variety of Orthoclase felspar, which can be cut and used as a gem stone. Amazon stone is a green variety of felspar.

Hornblende is a dark green to black, glassy Amphibole which is a complex hydrous silicate with Calcium, Magnesium and iron. It occurs in basic igneous rocks and schists.

Beryl is a silicate of Aluminium and Beryllium, and an ore for the latter metal which is used in atomic research. Cut specimens of beryl are used as gem stones.

Garnets are a group of common silicates, some of them being gem stones. One such gem stone, called almandite, is also displayed in the collections.

Kyanite is an Aluminium silicate which is usually found in gneisses and schists. The crystals vary in colour from white to black. They are long and blade-like. The hardness is interesting in that it is 4·5 along the vertical axis and 7 across the prism face.

Tourmaline is a borosilicate of Aluminium, Calcium, Potassium and Sodium, the crystals belonging to the Hexagonal System. The mineral is black, brittle, translucent and pyro-electric. It has a sub-conchoidal fracture and vitreous lustre. It is also cut and used as a gem stone.

Zeolite is a hydrous silicate of alumina and other alkalis. Different kinds are there, of which stilbite is one. It has a vitreous lustre and perfect cleavage.

Micas are hydrous silicates of Aluminium and other metals. They occur in the form of books in metamorphic and other rocks. India is famous for her micas. Micas have a perfect basal cleavage, which property enables peeling them off in paper-thin layers. They are good insulators against heat and electricity. The black forms are known as biotites which may also be green sometimes. The paler, almost colourless forms are known as muscovites. There are also other forms of mica, but only these two forms are exhibited.

Serpentine is a green silicate of Magnesium, occurring in a massive form with splintery fracture, and greasy lustre. It is compact and massive, but shows frequently decomposition into fibrous structure. It is only these fibres that form the "asbestos" of commerce. The massive variety is used for ornamental purposes.

Talc is also a silicate of Magnesium like serpentine. It has perfect basal cleavage, silvery-white colour, pearly lustre and greasy feel. It is also translucent, sectile and pliable. Impure forms have shades of yellow, green or red. A compact structureless variety of talc is known as steatite or soapstone. It is a raw material for the manufacture of face-powder, French chalk, etc.

A product of decomposition of silicates, is Kaolin. It is white and scaly when pure, but more often found impure with an admixture of clay. It occurs wide-spread. It finds extensive use in ceramics.

Tantalates, etc.

Samarskite is a rare earth with Radium and Thorium. It occurs in the mica-bearing rocks of the Nellore District of the Andhra State. It is priced high for its contents of radio-active elements.

Phosphates, etc.

Monazite is a complex mineral with Thorium and a few other rare elements. It occurs as small grains mixed up with sand at Cape Comorin. In recent years its importance has shot up as an ore for the extraction of Thorium which is a radio-active element.

Phosphatic nodules are mineral phosphates occurring in the Tiruchi District of the Madras State. It is said that they can be used as manure if properly processed for the purpose.

Sulphates

Gypsum is a sulphate of Calcium, and a very important and common mineral. It is formed as the result of evaporation of sea-water in arid conditions. It is used in the manufacture of plaster of Paris and Portland cement. Crushed gypsum neutralises alkaline soils. A fibrous variety, known as Satin spar, is used as an ornamental stone.

Tungstates, etc.

Wolframite is a tungstate of Manganese and iron, crystallises in the Monoclinic System and breaks with an uneven fracture. It occurs in tin-bearing regions and supplies the tungsten for the manufacture of tungsten steel.

ROCKS

Study of rocks is known as Petrology. Rocks are the materials of which the earth's crust is made. In science the term, rock, covers not only the solid bed-rock but also the loose inorganic debris over it. While most rocks are formed of several minerals or derived from other rocks (similarly formed of minerals), a few rocks are monominerallic. Some of the rocks do not show any specific mineral; they consist of glasses or they are derived from organic materials.

Rocks are classified chiefly on the basis of their origin. Three broad classes are thus recognised: igneous, sedimentary and metamorphic rocks. The igneous rocks have their origin in the magmas which are molten mixtures of minerals found in the interior of the earth; the sedimentary rocks are those that are formed as the result of erosion and deposition by rivers, etc., or of chemical action from contact with other substances; the metamorphic rocks originate from the action of high temperature and pressure on the other rocks because of deep-seated disturbances in the earth's crust.

The igneous rocks are further divisible into intrusives and extrusives. If the magma cools below the earth's crust, taking its own time to do so, it forms the intrusive rock. If on the other hand it reaches the surface

of the earth and thereby under-goes sudden cooling, it forms the extrusive rock.

Extrusive Igneous Rocks

Extrusive rocks on the earth's surface are derived from lava, and are difficult of identification and classification because of the fine-grained texture which is due to rapid cooling.

Basalt is the common, dark, heavy lava, composed of pyroxene and plagioclase felspar. The colour varies from grey to green and black.

Obsidian is a natural, dark-coloured glass. In thin fragments, it is light-coloured and transparent.

Pumice is a solidified volcanic froth and similar, in composition, to obsidian. It can float in water.

Andesite is darker than obsidian, as it consists of ferromagnesian minerals to the exclusion of quartz. When it is not possible to accurately identify this rock, the term, felsite, is used.

Obsidian and pumice represent the acid forms of extrusive rocks, and basalt the basic forms, and andesite the intermediate forms.

Porphyry is a fine ground-mass in which igneous rocks composed of crystals (phenocrysts) occur. In short, it consists of a matrix of crystalline grains with embedded larger crystals. Porphyries occur in both intrusive and extrusive rocks. They are named after the ground-mass. There are thus granite porphyry, syenite porphyry, etc. Porphyries are also named according to their colour, such as grey porphyry, blue porphyry, etc.

Intrusive Igneous Rocks

Granite is the most commonly known and seen intrusive igneous rock. It is formed of quartz and felspar, and is usually light-coloured. It finds use in construction works, sculptures, etc. In the Pudukkottai area the granite is of such fine quality as to be suitable for carving sculptures, etc., a representative collection of which can be seen in the Archaeology gallery.

Pegmatite is an igneous rock composed of very coarse grains with crystals ranging from an inch to a few feet in length. There are several kinds of granite, which are named according to the predominating minerals. There are in the Geology gallery, pegmatites, muscovite granite, biotite granite, hornblende granite, etc.

Charnockite is an intrusive rock which is quite suitable for building purposes, like granite. It is commonly used as road-metal.

Syenite is less common than granite. It consists mainly of felspar and mica or hornblende, and has an even texture.

Diorite is composed mainly of plagioclase felspar and ferromagnesian minerals and has usually a grey or dull green colour. Its texture is like that of granite.

Dolerite (also called diabase) is a fine-grained rock made mainly of Plagioclase and Pyroxene.

Pegmatite, granite and syenite represent the acid forms of the intrusive rocks, while diorite and dolerite represent the basic forms.

Sedimentary Rocks

Sedimentary rocks vary widely in texture, colour and composition. They cover about 75% of the area on the surface of the earth. The sediments carried by rivers and other agents of erosion, become, when consolidated into one solid mass, the sedimentary rock. The rocks of this kind develop in layers or strata and may contain fossils. A few important exhibits of sedimentary rocks in the Museum are detailed below.

Sandstones are formed by the action of wind, water and ice on older rocks. They mainly consist of grains of quartz cemented together. Some of them are hard and durable, while the others are not so. There are varieties of sandstones, depending upon the cementing medium and the "inclusions" at the time of formation. The exhibits include also an ivory-smooth sandstone, as well as a striped sandstone. The latter is from Karachi. There is on show a striated sandstone from Porbunder.

Rock-hard clays are known as shales or mud-stones. They have laminated structure and uniform texture. Their colour is varied. Shales find use in the manufacture of cement and ceramics. They vary according to texture and contents. Besides others, there is also one specimen of clay-stone (mud-stone) which is beautiful, mosaic and arenaceous.

A very fine, powdery form of clay which may sometimes be loosely pressed into soft, massive structures, is known as an ochre. Ochre occurs in different colours and finds use as a pigment. Yellow and red ochres are displayed in the gallery.

Limestones are formed as chemical precipitates, or as pieces of lime (secreted by plants and animals) cemented together. They are chiefly composed of calcite, and are very varied in respect of colour and texture. They may be in the form of loosely-adhering shells, or com-

compact fine-grained smooth rock, or they may include shales or sandstones in varying proportions. Limestones help in making concrete and lime.

The gallery contains shales, limestones and crystalline limestones. Chalk is a limestone formed of protozoan shells.

Small rounded pebbles (frequently of quartz or quartzite), cemented together, form the conglomerates. When the constituents consist of freshly broken materials with sharp edges (unlike the pebbles) the conglomerates are called breccias.

Metamorphic Rocks

Igneous, sedimentary or (even) other (metamorphic) rocks may become altered into metamorphic rocks. The alteration may only be very slight, or so complete as to lose all semblance to the original rock. The exhibits in the gallery are simple metamorphic rocks, gneisses and schists.

Rocks formed directly by the alteration of sedimentary rocks are conveniently spoken of as simple metamorphic rocks. Slates, marbles and quartzites in the gallery belong to this group.

Slate is the product of metamorphism of shale. Its colour is varied. The slate has a good cleavage plane and can be split into sheets. It is used for roofing and other purposes. Strong, thick and durable sheets of slates occurring at Cuddappah in the Andhra State are known as Cuddappah slabs. They are very useful in many sundry ways in Indian homes.

Limestones recrystallise and form marbles, under the influence of heat and pressure. Marbles occur in varying colours.

Sandstones, on recrystallization under the influence of heat and pressure, become quartzites. The quartzites are hard, tough and massive rocks. They occur in various colours.

Schists show a greater degree of metamorphism than the fore-going metamorphic rocks. They consist of coarser grains and produce, while breaking, a very uneven surface which is typical of them. They are named after their principal mineral. Thus there are mica schist, kyanite schist, etc.

Gneisses are so varied that it is impossible to give any single, simple definition. They are metamorphosed igneous, sedimentary or even *other metamorphic* rocks. It would however suffice to say that gneisses are generally coarse-grained rocks with the minerals so arranged as to form

parallel streaks or bands, and that they lack in the schistose appearance. As the schists, so too the gneisses are named after their principal mineral. In addition, they are also named according to their origin or structure. Thus there are biotite gneiss, granite gneiss, etc.

Some igneous rocks, like the Deccan traps in South India, undergo a peculiar change, known as lateritisation, when free silica (or quartz) is absent in them. The end product is called laterite which is porous, pitted and clay-like. It is a soft rock and can be easily cut with a knife; but on exposure the surface hardens forming a protective limonitic crust which is brick-hard. The colour of the rock varies with its composition, but the brownish varieties are the commonest.

FOSSILS

Fossils are the remains, prints or other evidences of former existence of life. They go to show the kinds of plants and animals that lived in the past and are no longer existent. They indicate also the climatic conditions of the past in relation to a given locality. They may be found preserved intact in Nature, or as carbonaceous films, or as silicified or calcified materials, etc. The Museum collections include both animal and plant fossils, though they are but small.

Plant Fossils

There are specimens of fossil wood, both gypsified and silicified. The gypsified specimen comes from Ariyalur in the Tiruchy District. A specimen of fossil cone (of *Lepidostropus*) is also included in the collections. The leaf-impression of a fossil Cycad is also displayed.

Animal Fossils

The animal fossils in the Museum belong to the Invertebrate group. The materials on display are the exo-skeletons (in the form of shells) of back-boneless animals. Only four of their numerous phyla are represented.

The Coelenterata are represented by a *Favosite sp.* and *Zaphrentis cylindrica*. They may be popularly termed fossil corals.

The Phylum Mollusca which includes snails and slugs, oysters and mussels, periwinkles and whelks, is one of the largest phyla and has also the largest number of representatives in the gallery. The representative classes of animals are the Gastropoda, the Lamellibranchiata and the Cephalopoda. *Murex sp.*, *Rimella sp.*, and *Turritella angulata* represent the Gastropoda in the collections. Representative genera of the Lamellibranchiata are large specimens of *Exogyra*, *Ostrea*, *Spondylus*, *Gryphea*, *Pecten*, *Alectryonia*, *Inoceramus*, *Arca* and *Nucula*. The Cephalopods

are *Nautilus*, *Ceratite*, *Ammonite*, *Orthoceras*, *Acanthoceras*, *Phylloceras* and *Belemnite*. Of these the first two are fairly large specimens.

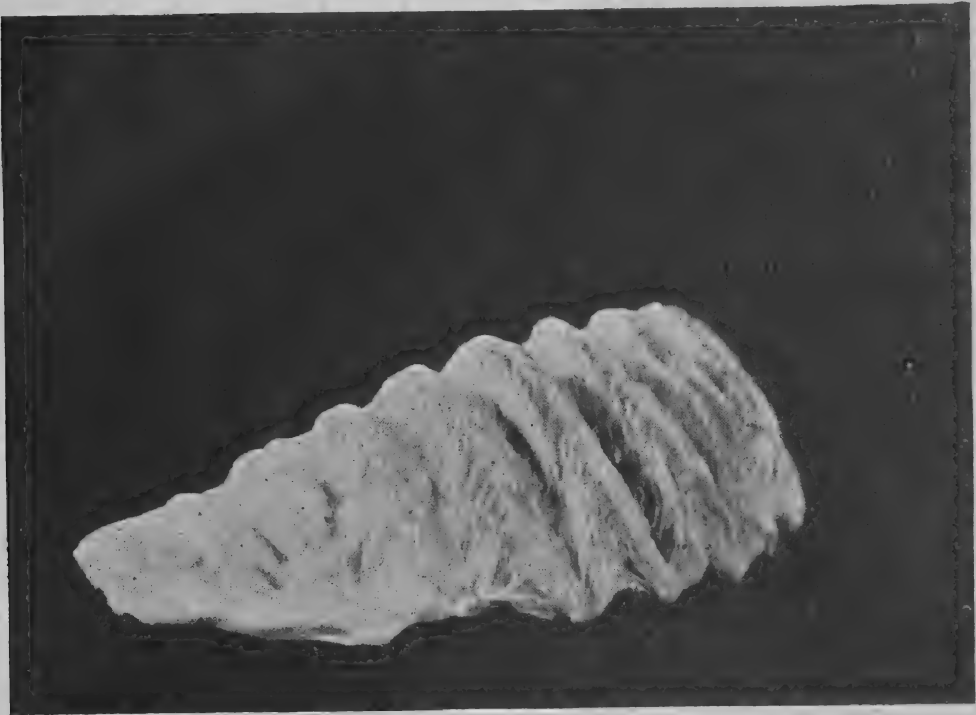


Fig. 3. A FOSSIL LAMELLIBRANCH SHELL (*ALECTRYONIA* SP.)

Fossils of *Breynia* and *Hemiaster* belong to the Phylum Echinodermata which comprises also of the star-fish, the sea-urchin, etc.

The Brachiopods are marine animals with bi-valved shells, the valves being placed dorsally and ventrally. Their representatives in the Geology gallery are *Pentamerus oblongus*, *Spirifer* sp., *Spirigera striata* and *Terebratula carnea*. The Brachiopoda includes in its fold, an enormous number of fossil forms, the extinct ones out-numbering the existing ones by far. It contains also some of the oldest living species of animals.

Zoology Section

From the Geology gallery, the visitor may step into two other galleries, the Numismatic gallery and the Zoology gallery. A brief mention of the former is made elsewhere, while the latter gallery is described below.

The zoological collections are fairly representative of the *fauna* of the Pudukkottai area which, in its turn, represents the *fauna* of the South Indian plains. In addition to them, a few extra-regional materials are also included. The zoological exhibits form the largest collections in the Museum. They can be conveniently divided into two groups: the Vertebrata (those with a vertebral column or backbone) and the Invertebrata (those without the backbone). While the Vertebrates form a phylum by themselves, the Invertebrates are composed of a number of phyla. The Invertebrate phyla in the Museum are Porifera, Coelenterata, Mollusca, Echinodermata and Arthropoda. The Invertebrata are arranged at two separate places, the Arthropods alone forming a separate gallery in the portion marked 6a in the plan of the buildings, and the rest of the Invertebrates forming another gallery at the portion marked 6d.

The zoological collections occupy nearly half the available accommodation in the Museum. Only the more important exhibits are referred to in these pages, therefore.

The Zoology gallery has a few dioramas, built up by Sri T. S. Sundaram (former Curator), which enliven and add additional charm to the collections. The dioramas display the natural history materials in the way they are generally met with in nature. The individual dioramas are separately mentioned in this book when describing the different collections, to which they relate.

PORIFERA

It is to the Phylum Porifera, that the various sponges belong. The sponges are colonial and have a cellular structure. The internal body-cavities of the individuals in the colony, communicate with each other. They are therefore much like the Coelenterata in appearance. But they have their differences also. The members of a colony of Porifera are so much alike that it is not possible to divide them into different types of individuals. Water enters the cavity of these animals from the sides of the body through numerous pores, and passes out through an apparently mouth-like opening at the top. The phylum owes its name to the

presence of these inlet pores in the body-wall of the individuals. The colony has its foundation in a number of horizontal stolons which cling to a substratum. The tall vertical case containing the corals, exhibits also a fairly good collection of sponges. There is also one specimen of a sponge growing on a bi-valved shell. The sponges have commercial value as yielding a toilet material for the bath.

COELENTERATA

The Phylum Coelenterata consists of multinucleate animals which are radially symmetrical, and which have only one body-cavity. The internal body-cavities of the individuals in a colony, inter-communicate. All the individuals are not alike. The same opening serves both as an inlet and as an outlet for the body-cavity. Most of them are soft-bodied but a few sedentary and colonial forms have exo-skeletons which form the corals. These latter require a tropical climate and shallow seas with a rocky shore, for development. These conditions are plentifully available around the extreme southern shores of India. This is a large phylum, consisting of two sub-phyla and a few classes, orders and sub-orders. The collections represent only a few important animals of the phylum, and only the more important ones among them are mentioned in these pages.

Class Scyphozoa

The Jelly-fish in the gallery, is a typical representative of the free-swimming forms. It has the shape of a clear crystalline bell. It swims gracefully in the sea by alternately expanding and contracting its body. It has stinging tentacles. Its food consists of the minute organisms in the sea. *Rhizostoma sp.* and *Cassiopea sp.* are a few other members of of this class.

Class Actinozoa or Anthozoa

Animals of the Class Actinozoa have a large body and better developed muscular and skeletal elements. A calcareous skeleton is generally present, but its formation differs with the groups.

The specimen, *Spongodes pulchra*, is somewhat irregular in shape. It is a sedentary form with a sterile base. The skeleton is in the form of spicules, and there is no axial skeletal rod. A beautiful spirit-preserved specimen of this species is also on display.

A long and beautifully-mounted specimen of *Cavernularia sp.* is seen among the spirit-preserved exhibits. It is colonial and the body-cavity of the colony is divided into a *stalk* (or peduncle) embedded in mud or sand, and a *rachis* projecting outside. The rachis is the main polyp from which numerous polyps are given off.

The Corky Gorgonium (*Suberogorgia suberosa*) is a beautiful specimen looking like a cork model. The axis is made up of closely-intercalated and elongated spicules, and is surrounded by a series of longitudinal canals which connect with the body-cavities of the animals. These species are colonial and build up their exo-skeletons, one of which is on display in the gallery.

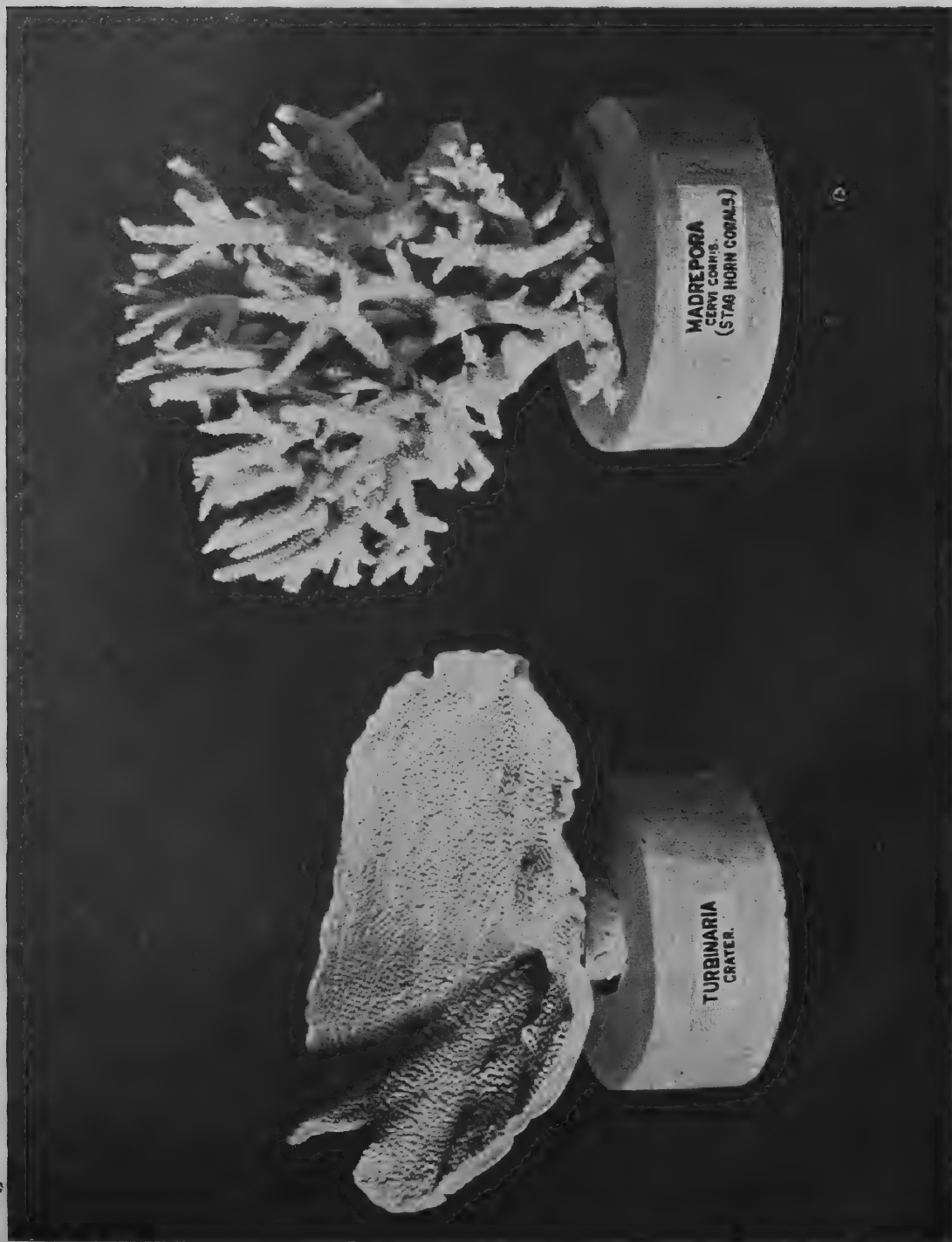


Fig. 4. CORALS (TURBINARIAN AND MADREPORAN).

An exhibit of the Sea-fan (*Gorgonia sp.*) in the gallery looks like a lady's fancy hand-fan. It is of a dull grey colour with interspaces which give the appearance of a reticulated or well woven material. The animals building up this exo-skeleton make upright colonies and branch generally in one plane only. The axis is sometimes calcareous.

The Sea Anemone (*Alicia sp.*) has a flower-like appearance and occurs in sea-water pools on rocky shores. It is sedentary and attaches itself to the substratum by a soft, fleshy, contractile column. It has a mouth at the distal end which is encircled by contractile tentacles. It feeds on small organisms. In the gallery a spirit-preserved specimen is shown attached to the carapace of the Crustacean, *Dorippe sp.*

A specimen of the Tree Coral (*Antipathes sp.*) in the desk-like show-case looks like a toy coniferous tree. It has an axial, hollow, horny, skeletal rod.

The Mushroom Coral (*Fungia echinata*) is a calcareous skeleton secreted by the animal. It has a close resemblance to the mushrooms. Hence its popular name.

The Stag-horn Coral (*Madrepora cervicornis*) is interesting in that it looks like the horns of a stag.

Turbinaria peltata is the largest coral in the collections.

MOLLUSCA

The Molluscs are soft-bodied, cold-blooded, Invertebrate animals the bodies of which are not divided into segments. Excepting a few the Molluscs possess a shell secreted by a fold of skin, known as the mantle. When the shell consists of only a single piece it is called univalved, and when of two pieces bivalved. In some species the eggs have a covering of tubes or capsules. To man, the Molluscs are of great economic importance. They have been used as food from the pre-historic times. The Molluscs are also commercially important as fish-bait. Many of their shells are valued as ornaments and decorations. Our indebtedness for the pearl is due to the Molluscs. Some molluscan shells have been in use as money.

The Molluscs include also some of the most ancient of animals which have become extinct long back. They are divisible into five classes. All of them except the Class Amphineura, are exhibited in the Invertebrate gallery.

Class Gastropoda

The Class Gastropoda contains in its fold belly-footed molluscs which crawl on a muscular disc-like foot. The larva develops a

univalved shell which may become rudimentary or absent in the adult. The Gastropods have rasping tongues. The mouth is situated in the foot. Most of the Gatsropods are gill-breathers while a few are lung-breathers.

The Ear-shell (*Haliotis gigas*) is of gigantic size. It is used as a pearl-inlay in the construction of mansions, as its mother-of-pearl lining has an attractive colouration. Sometimes pearls, too, occur in the mantle, but their value is low on account of the colouration. The exhibit is of a very big size.

The Turban-shell (*Turbo corniculatus*) is conical and pearl-like within. The one on display in a sloping case is of fairly big size. The larger specimens are commercially valued for making pearl buttons.

The Horn-shell (*Telescopium telescopium*) is abundant in the mangrove swamps along the coast. The apex of the shell is drawn out into a spire. It is used for making lime.

The Scorpion-shell (*Lamb's cheragra*) develops hollow finger-shaped processes with age. In the older specimens these fingers get filled up and become solid. Some of these shells provide shelters for small Octopuses. These shells are used as fish-baits. The specimen in the gallery is of an adult Scorpion-shell.

The Tiger Cowry (*Cypraea tigris*) and the Black Cowry (*C. mauritiana*) are some of the best known molluscs of India. Their shells are well-polished and attractively coloured. The Cowries live under boulders in shallow seas with coral reefs. The Tiger Cowry has large bordered spots. The Black Cowry is a handsome specimen. These forms are used often as fancy table-weights.

The Chank (*Xancus pyrum*) is also included in the exhibits. It is gregarious, living on tube-worms at the sandy bottom of shallow seas. The shell is of great economic importance. It is cut, carved and used as bangles. The smaller shells are used as amulets for protection of cattle against the "evil eye". While a majority of the shells show a right-handed twist, a few show a twist in the opposite direction. These sinistral forms are rare, worshipped as an emblem of Vishnu's (mentioned under Hindu sculptures) and zealously treasured in the Hindu temples. A similar sacred esteem is accorded to it by the Buddhists in Tibet. The Chank is also used as a trumpet. The specimen in the gallery has a right-handed twist. An egg-case of the Chank is also shown among the spirit-preserved exhibits.

The Helmet-shell (*Cassis cornuta*) is the largest shell in the collection. It is something like a small helmet studded on the exterior with spikes. Hence it rightly deserves its popular name.

The Melon-shell (*Melo indica*) is rather an interesting specimen. When young it is elongate with a spire. The animals' body grows so fast that the spire gets hidden inside the almost globular adult shell which is generally large and beautiful.

The Cone-shell (*Conus figulinus*) has a more or less conical shape with a short and insignificant spire. It is believed to be poisonous but valued highly for its brilliant colour.

The Sea-Hares (*Aplysia sp.*) are interesting in that their shell is very thin to the point of transparency, ear-shaped and brown. The animal has a grotesque shape, and feels soft to the touch. When apprehending danger the animal discharges a dark fluid from below the mantle, discolouring the water, and escapes under such cover. There is also another Sea-hare (*Notarchus sp.*) in which the shell has not developed at all. Its gelatinous egg-chords contain ova. Specimens of both these Sea-hares and also the egg-chord of *Notarchus sp.*, are on display.

Nudibranchs are Gastropods with exposed gills. They have no shell of any sort, but some of them contain spicules, and some others stinging cells, in outgrowths of the back. A few nudibranchs are also included among the exhibits.

Species of *Ariophanta* in the gallery are even more interesting. They are Gastropods which have taken to air-breathing. They belong to the Natural Order, known as Pulmonata, which includes also the snails and slugs.

Class Scaphopoda

The Scaphopoda have neither eyes nor true tentacles nor even a distinct head. They represent specialization over the Gastropods on the one hand, and appear to be degenerates on the other. The edges of their mantle join together forming a tube. Consequently the shell is also tubular in shape. The rear end is narrow and the front one a bit wider, thus giving the shell the appearance of a tooth. Hence these shells are known as the Tusk-shells which form the only genus of the Class Scaphopoda. The species exhibited in the gallery is *Dentalium octogonum*. It is common in the Indian coast. It has a white, tooth-like, small shell. The specimens in the gallery justify the older mistaken belief that they are tube-forming Annelids.

Class Lamellibranchia

The Lamellibranchia are Molluscs which have their shells in two parts or valves. Hence their popular name, bivalved shells. The

mantle is of two lobes which envelope the body between them. Head and teeth are absent. The breathing organs are the gills. There are both sedentary and mobile forms.

The Window-pane Oyster (*Placenta placenta*) is about 6" in diameter at its maximum size. The adult is circular in outline and occurs in estuaries, lying prone on the muddy bottom. The shell resembles mica in substance. Small shells are colourless and translucent. The Window-pane Oyster can be used for making ornamental doors for windows and for extracting a high-quality lime for the Betel leaves. It produces soft and cheap seed-pearls which are useful in indigenous medicines in India.

The Hammer Oyster (*Malleus vulgaris*) is a black, curiously-shaped shell. Two enormously-developed ears correspond to the hammer-head, and the long narrow body corresponds to the handle. A specimen of this funny-looking shell is also included in the exhibits.

The Scallops (*Pecten sp.*) are also adequately represented in the gallery. When young they are sedentary, and as they grow they lose their hold on the substratum and rest free on the convex side of their valves, at the bottom of the water. Some of them can even move about in water, by alternately and rapidly opening and shutting their valves.

The Indian Edible Oyster (*Ostrea virginiana*) has a number of scientific, as well as popular, names, since it occurs in various forms. It is a backwater Mollusc and can withstand changes in the grades of salinity of water. On account of its edibility, it is also cultivated for the market. Its value as man's food is the highest among the Mollusca.

The Pearl Oyster (*Meleagrina margaritifera*) is a bi-valved Mollusc, the calcareous secretion of which forms the pearl. The pearl consists of extremely thin layers of Calcium carbonate deposited around a foreign object within the valves. The iridescent colours are due to the interference of light by thin layers. Pearls are of different colours and sizes. Their value increases with size and purity. In the gallery there is a bivalved Pearl Oyster showing the valves *in situ* from Ceylon. There is also another specimen which is beautifully mounted and displayed showing the pearl itself *in situ*.

The Pinna is represented in South India by several species. Of them *Pinna bicolor* is the most common. It is a wedge-shaped shell of varying sizes. A big specimen is included in the gallery collections. This animal lives at the sandy bottom of shallow

seas. Pearl Oysters sometimes cling to the Pinna shells. On one spirit-preserved exhibit in the gallery *Balanus sp.* are seen clinging. The pinna shells are mainly of academic interest.

Class Cephalopoda

The Class Cephalopoda comprises the free-swimming marine molluscs which have muscular tentacles and two or four plume-like gills. They may be divided into two sections according to the number of gills. The two-gilled forms have no external shells, whereas the four-gilled ones have external shells. The foot of these animals is modified into a number of tentacles with suckers (except in *Nautilus*).

Section Octopoda

The octopus which comes under this division has eight tentacles and two gills. The tentacles have suckers and the mouth is strong, powerful, and beak-like. The animal changes its colour with lightning speed, to suit the background so as to remain concealed when stalking its prey. The octopus feeds on shell animals, fishes and crabs. They are also caught and used as baits for certain fishes. The octopus is also endowed with an ink-sac from which a coloured fluid is ejected to provide cover from a pursuing foe. The specimen in the gallery displays the tentacles and suckers.

Section Decapoda

The Decapoda have two gills and ten tentacles (as against the eight in Octopoda). They are free-swimming forms, making shoals in the open sea.

The Common Squid (*Loligo sp.*) is one of the most active Cephalopods. It has a long, torpedo-like body and a powerful fin on each side. This structure facilitates its quick movement in water. The squid has short, eight, stumpy tentacles, making a sort of a floret around the mouth and two long tentacles each arising on either side the mouth. The suckers are concentrated at the distal end of these longer tentacles. A thin, translucent, light, stiff structure is present inside the body, forming an endoskeleton, as it were. As in the Octopus, so too in the Common Squid, there is an ink-sac for use in self-defence. Its edibility gives it commercial importance.

The Cuttlefish (*Sepia sp.*) is similar to the Common Squid, but differs from it in having a large, fleshy and flattened body. It is a ten-armed and two-gilled Cephalopod. The internal support

is broader and stouter than its counterpart in the Common Squid. It is made up of calcareous flakes with air-spaces between them. This bone-like material has commercial value, in that it is used for rubbing down paint. The school children clean their slates with this material. A brown pigment, known as "Sepia," is obtained from the ink-sac of the Cuttlefish, for trade. A Cuttlefish and its egg-case are also exhibited.

The Ram's Horn-shell (*Spirula sp.*) is interesting in that very little is known about its soft parts. The shell, like the "bone" of the Cuttlefish, is an endo-skeleton. It is however in the form of a loosely-coiled, white, tubular structure. Its hollow is divided into apartments by a series of concave septa. The chambers communicate with each other by a narrow tube. Both the *Spirula* and its egg-capsule are displayed in the gallery.

The Pearly Nautilus (*Nautilus sp.*) is a four-gilled Cephalopod. Its relatives peopled the globe in the remote, geological past and their remains are collected from some of the oldest fossiliferous strata. One of them, a (fossilised) specimen of *Ammonite*, is exhibited in the Geology gallery. It is gregarious and nocturnal. It crawls at the bottom and feeds on crabs and shell-fish. This Cephalopod has no ink-sac. It takes shelter inside its external shell which is discoidal, coiled in one plane and chambered with concave septa. The chambers intercommunicate as in the Ram's Horn-shell. The animal fills the chambers with a gas which helps the body float or balance in water. The septa and the interior of the shell are pearly. Hence the popular name.

ECHINODERMATA

Parts of the animal belonging to the Phylum Echinodermata, are arranged radially in fives. Calcareous plates and spines are borne in the body-wall. The body-cavity is divisible into a perivisceral cavity and a water-vascular system.

There are a few spirit-preserved specimens of *Studeria mirabilis* in the gallery. They show the ability of these animals to work their tube-like feet by a hydraulic system. They can send water into the feet and distend them, or withdraw it and bring about their collapse. The feet, by alternately distending and contracting, are able to help these animals in their locomotion.

ARTHROPODA

The Arthropods are Invertebrate animals with jointed legs. They are divided into five classes: Onychophora, Crustacea, Arachnida, Myriapoda and Insecta. The Arachnids have no antennae, the

Crustacea have two pairs of antennae and the rest have only one pair each. The body divisions are not clear in the case of the Onychophora, whereas they make a head and a long trunk in the case of the Myriapods, and a head, a thorax and an abdomen in the case of the Insecta. These are some of the easily and rather artificially recognizable features of the five classes of Arthropods.

Class Onychophora

The exhibit of *Peripatus* is the only representative both in the gallery and in nature, of the Class Onychophora. It is a primitive Arthropod and treated as a connecting link with the Phylum Annelida.

Class Crustacea

The Crustaceans are well represented in the gallery, and include the crabs, prawns and spiny lobsters. *Scylla serrata* is the biggest in the collection of crabs. The shell of *Carpilodes margaritatus*, another big crab, has large, bright, red dots on the back. There are also other specimens of crabs which are a little smaller in size, but which show beautiful patterns of colour-combinations. *Pagurus setifer*, one of these exhibits, resembles a big scorpion. Specimens of sand-crabs (*Hippa sp.* and *Albunea sp.*) are beautifully mounted and displayed. They live in shallow-waters, keeping themselves buried in sands. Their bodies are generally cylindrical.

The Mantis Prawn (*Squilla mantis*) is closely related to the common Prawn. The shield on the head and neck is too short to cover the latter. The five front pairs of feet that come from the neck, are directed forwards and the three hind pairs are bifid and turned backwards. An ordinary prawn (*Palaeomon sp.*) of a very big size, is also on display. It measures about two feet in length.

Dorippe sp., another Crustacean, has a carapace which is truncated in front. An interesting specimen of this animal is on display in the gallery. It is carrying on its back a Sea Anemone.

The Acorn-shell (*Balanus sp.*) has a shell which consists of six plates and an operculum of four valves. These animals are hermaphrodites, marine and sedentary. In the gallery the specimens are shown attached to the shell of the mollusc, *Pinna bicolor*.

The Ship Barnacle (*Lepas sp.*) is a close cousin of the Acorn-shell. It consists of a fleshy stalk and five calcareous shells enclosing six pairs of appendages. It attaches itself to floating wood by the stalk and feeds

on minute organisms, separating them from other particles with the help of its appendages. This as well as the preceding exhibit are spirit-preserved specimens.

The Spiny Lobster (*Palinurus vulgaris*) has claws which are borne by the first pair of limbs. The abdominal limbs are rudimentary. The tail has a number of flat shell-like plates which can be spread out like a fan for use in swimming. Lobsters in fresh and good condition, are valued as nourishing materials.

One of the spiny lobsters in the gallery is a fairly large specimen. It measures about three feet in length.

Class Arachnida

The Arachnids comprise the scorpions, spiders, mites and ticks. A few of the biggest scorpions (*Buthus aser*) and biggest spiders are seen in the collections. The biggest Arachnid is the King Crab (*Limulus polyphemus*). It is however *not* a Crustacean. It looks like the top part of an over-size steel helmet.

Class Myriapoda

The centipedes and the millipedes that constitute the Myriapods, are adequately represented.

Class Insecta

The Insecta is the largest known class of animals, comprising over 60% of the number of known living species. The Museum collections too are fairly exhaustive for the region. To mention a few there is a very big specimen of the Atlas Moth (*Attacus atlas*) and its cocoon. The Moon Moth (*Actias se'ene*) and the Tassar Moth (*Anthereae paphia*) with their cocoons, form an attractive series. The eggs and silk of the latter make the exhibits both interesting and educational. Mantis (*Gongylus gonailoides*) is a typical illustration of insect camouflage. It can be hardly distinguished from twigs with dried-up leaves. It helps the farmer by predateding on harmful insects which destroy crops. Another illustration of camouflage is shown by the Hooded Grass-hopper (*Teratodus monticollis*) which resembles a bunch of dry leaves. The Rhinoceros Beetle (*Oryctes rhinoceros*) is interesting because of a protrusion which resembles the horn of a rhinoceros. Its importance lies in the fact that it is an insect to be annihilated, as it does extensive damage to the coconut palms. Its grubs are also exhibited, but in a separate wall-case. The Mango-stem Borer is represented by its grubs which are of an impressive size. Some Giant Water Bugs (*Belostoma indicum*) and their eggs are rather imposing on account of their size. A collection of insect-nests, forms a very popular, educational group. Nests of all kinds of insects (bees, wasps, etc.) are included in it.

No account of the Arthropodan exhibits can be closed without at least a brief description of the diorama of Arthropods of which this Museum has every right to be proud. It is a speciality of the Natural History Section. A picture of the general habits of the commonly-known



Fig. 5. DIORAMA OF ARTHROPODS. A PAIR OF BUTTERFLIES AND A SCORPION CAN BE EASILY SEEN; OTHERS HAVE MERGED WITH THE BACKGROUND.

Arthropods, in one glance, cannot be readily had any where else. The natural conditions are so beautifully represented in it. Two scorpions (frightfully large ones) are seen holding their prey (cockroaches), while a third is still on the look-out for its meal. Butterflies are seen flirting about a shrubby vegetation. A grass-hopper is ready to make its next hop. A chafer beetle (*Anomala* sp.) is seen coming to the light. Half-a-dozen ants are on their march in a single file to their ant-hill, like the troops in a battle-area. A dragon fly keeps hovering above a small, stagnant pool of water. The millipedes and the centipedes are busy in their own way. One of them has taken to its characteristic posture which is assumed when apprehending danger. A couple of wasps are busy searching for the grubs, in the way they generally do in the field.

VERTEBRATA

The Phylum Vertebrata consists of those animals which have a vertebral column. In addition they generally possess a bony endo-skeleton. They are so varied in organisational details, that they are split up into a few Classes, e.g., Pisces, Amphibia, Reptilia, Aves and Mammalia.

Class Pisces

Pisces or fishes are vertebrate animals which live in water breathing chiefly through the gills, the air dissolved in it, and having fins for their

locomotion, and having also generally a covering of scales over their bodies. Some fishes have only undeveloped bones, and some others fully developed bones. Most of them are oviparous, but there are a few viviparous ones also. Most of them live in the sea, while a few live in fresh-water and a few others live in both sea-water and fresh-water (migratory forms). The fishes are divisible into five sub-classes of which only two, the Elasmobranchii and the Teleostei, have representations in the gallery. The Fish gallery begins where the Birds gallery ends. The Teleosts are arranged at this end, and the Elasmobranchs at the farther end and both of them get mixed up at the centre.

Sub-class Elasmobranchii

The Elasmobranchii are fishes with a cartilaginous endoskeleton. Their scales are of various shapes and often possess spines. They have no air-bladder. Most Elasmobranchs are viviparous. The eggs of the oviparous forms are large and contained in a horny case or shell. The shell is an oblong horny covering generally provided with coiled tendril-like structures at the corners for attachment to the substratum. The same case may have one or more eggs according to the species concerned. The one on display is like a leather-casing for a giant wrist-watch.

The Elasmobranchs are the most ancient of known fishes, carnivorous and mostly marine.

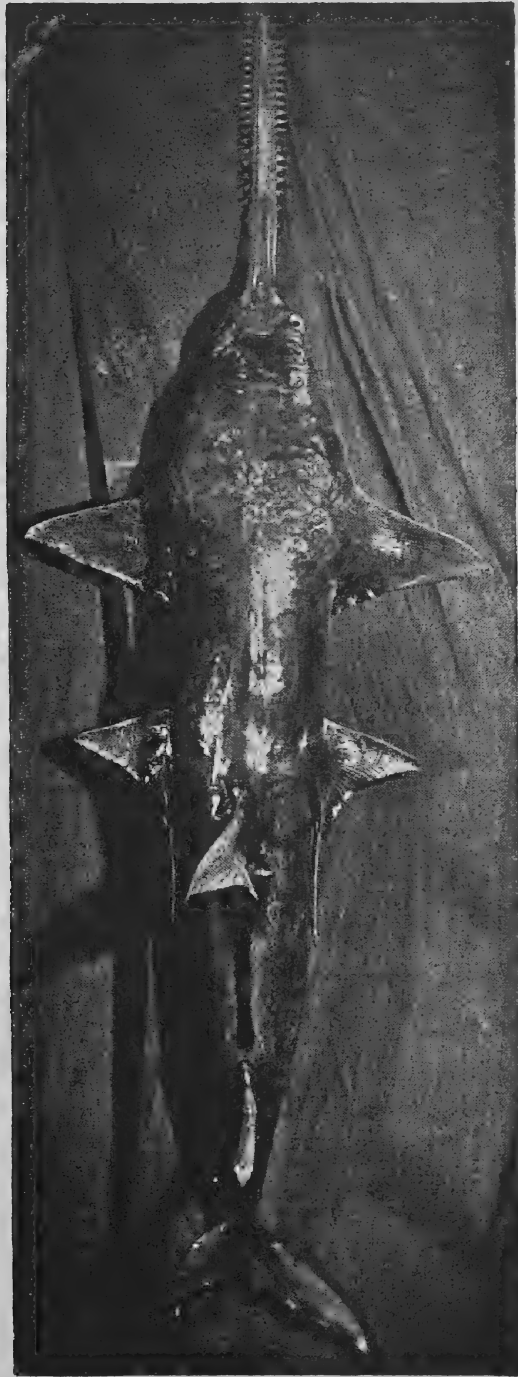
The typical dentition of Elasmobranchs is clearly illustrated in the exhibit of the jaws of a shark. The teeth are finely pointed, incurved and effectively prevent the escape of prey. The teeth in the front wear out and fall off, and are successively replaced by those from the back.

Of the five Natural Orders, into which the Elasmobranchs are divisible, only one, Selachii, is represented in the gallery.

The Tiger-shark (*Stegostoma tigrinum*) lives in the Bay of Bengal and the Arabian Sea. Its dorsal fins are devoid of spines. The mouth is situated on the ventral side of the head, and has very small teeth. In length the tiger-shark can grow upto 15 feet. The longest specimen in the collection, is 4 feet in length.

The Hammer-headed shark (*Zygaena sp.*) has a hammer-shaped head, as its name indicates. It lives in the temperate and tropical seas. Its eyes are situated at the extremity of the lateral lobes of the head. A big specimen of this species is displayed on the wall.

The Saw-fish (*Pristis cuspidatus*) is a skate with a saw-like protrusion in front of its head, which is but the extended rostrum. It inhabits tropical and sub-tropical seas. It has a compressed body with gill-slits



**Fig. 6. SAW-FISH WITH PRO-
TRUDING SAW-LIKE ROST-
RUM**

on the under surface. It feeds on molluscs and crustaceans, and prefers to remain at the bottom of the seas. The exhibit on the wall measures 8 feet in length. An isolated saw-like rostrum by its side is 4 feet 4 inches long.

The Electric Ray (*Narcine temlei*) is interesting for its electric organ which is situated laterally a little behind the head. It has a very long tail. It inhabits the tropical and sub-tropical seas, feeding mainly on molluscs and crustaceans.

The Sting Ray (*Trygon sephen*) has a long and slender tail without lateral folds. The vertical fins are absent. The spines on the tail inflict severe wounds. There are two large specimens, the larger of them being exhibited in a separate show-case. A very long tail of a Sting Ray is also separately shown. It measures 4 feet 8 inches in length.

An Eagle Ray (*Myliobatis narinari*) in the gallery has a prominent tail which is thin and whip-like. Another Eagle Ray (*Dicerobatis eregoodoo*) is interesting for its horn-like projections of the head. Its tail is short. These fishes live in the tropical seas. The extremity of snout has a pair of fins, and the region corresponding to the shoulders has no fin.

The Guitar-fishes (*Rhinobatus granulatus*, and *R. djeddensi*) have a long and strong tail with a longitudinal fold on each side. They live in the tropical and sub-tropical seas, feeding on molluscs and crustaceans.

Sub-class Teleostei

The Teleostei are a group of fishes, which have a bony endoskeleton and often an air-bladder. Their bones are well ossified in contrast with those of the cartilaginous fishes. The skeleton of a bony fish is very neatly displayed in a separate show-case at the far end of the gallery. The air-bladder occurs in varying forms. It may serve as an organ for merely storing air in some fishes, and for respiration in others. Its function is however still in dispute, numerous theories having been put forward regarding the same. A specimen of this air-bladder is exhibited along with the skeleton of a bony fish. Their bodies are of various shapes. This Sub-class comprises six Orders and thirty-six Sub-orders. Out of thirty-six Sub-orders only seven find representations in the gallery.

The Cat-fish (*Wallago atta*) in the collection is a scale-less fish. They live in fresh-water and are popularly termed fresh-water sharks. They belong to tropical and temperate regions. Some of them can stay for a short while on land, since they have an air-bladder. The specimen in the gallery has a pair of bristle-like structures hanging from the lower jaw.

The eels in the gallery are imposingly long. One of them (*Muraenesox talabon*) in the collection, measures 5 feet 9 inches in length, and has spine-less fins. It is a scale-less fish of the tropical seas. Its breeding ground is the deep-sea, and the growing place the fresh water rivers. These fishes therefore keep migrating from fresh-waters to deep sea and *vice versa*.

Belone sp. is a scaly fish with green bones. Both its jaws protrude in front like a beak. The head alone of a specimen is displayed. Its lower jaw is several times longer than the upper.

The Flying Fish (*Exocoetus poccilopterus*) is also a scaly fish. Both its jaws are short. A pair of fins from the sides are much elongated and used as a parachute for making long leaps and gliding in the air. Hence the popular name.

Ophiocephalus leucopunctatus is an Indian fresh-water fish which has a long air-bladder and which has also an accessory mechanism for carrying on aerial respiration. These fishes are therefore able to survive drought, remaining in dry mud. Their head and body have a covering of scales which are rounded at the ends.

Macrurus macrurus in the gallery is a very long specimen with the body ending in a compressed and tapering tail. It is a kind of deep sea eel. The exhibit measures 7 feet in length.

The Red Mullet (*Upeneoides indicus*) is an edible fish with a covering of scales which are large and thin.

The Gourami (*Osphronemus gourami*) is a fresh-water edible fish. It is a delightful specimen for the aquarists. It can jump up into the air and receive its food.

The Mackerel (*Cyhium guttarum*) is valued as food. It is pelagic and wide-spread in occurrence. Its muscles are richly supplied with blood, and are therefore red in colour. Specimens of a fairly big size are displayed in the vertical cases.

The Sword-fish (*Histiophorous gladius*) is an interesting specimen. Its upper jaw is elongated forwards into a sword-like weapon and hence its popular name. It is also called the Peacock Fish, since one of its fins on the back is broad and raised up like the tail-feathers of a courting pea-cock. Some of these fish can attain a length of nearly 15 feet. They are pelagic in tropical and sub-tropical seas. They can fight with whales and small vessels with the help of the long swords which may grow up even to 3 feet, and which are capable of piercing even thick planks. The sword-fishes are edible. The specimen on display is one of the longest fishes in the Museum, measuring about 14 feet 3 inches in length.

The Flat-fish (*Psettodes erumei*) is another interesting specimen. It is accustomed to remain lying on one side (usually on the right side) only, at the bottom of the water. In consequence it undergoes a few structural changes. When young, both the sides of the body are alike with one eye on each side. With age, it prefers to remain below the water on one side only. The anterior part of the brain-box so twists itself as to get both eyes on the right side. The lower side is very pale and white in colour. These fishes do not have the air-bladders; they have no use for them either. They are exhibited in one of the desk-like show-cases.

The Globe-fish (*Tetrodon sp.*) is another comic specimen with a narrow mouth and a globe-like body. It is an inactive marine fish of the tropics. Its teeth are fused together, forming a sort of a beak with a median suture. The body appears inflated like a ball, owing to the air being drawn in and stored in the oesophagus. They are not edible, the flesh in some species being even poisonous. The Globe-fish are displayed in the show-cases nearer the Birds gallery.

Class Ambhibia

The Amphibians usually have leg-like and hand-like limbs and breathe by lungs. Their young ones are known as tadpoles which do not have the limbs at birth. They are born with tail and gills and live in water. They gradually undergo a change or metamorphosis, lose their tail and gills, develop legs and lungs, and finally become the adults. The skin of the adults aids in respiration and is therefore kept moist and generally slimy. In some exceptional cases the tadpole completes its life cycle within the egg itself before hatching. These stages in the development of the tadpole are very clearly demonstrated in the gallery with a typical illustration of the tadpoles of a frog at different stages of their growth.

Of the three Natural Orders composing the Class, Amphibia, only one, viz. Ecaudata, is illustrated in the gallery. This order includes the frogs and toads. The adults have strong limbs, and short and broad bodies without tail. They move by jumping from place to place. Many of them can even climb. The climbers have suckers on their toes. The Amphibians are devoid of teeth in lower jaw. They are generally nocturnal. They feed on small Invertebrates. Their tongue is long, sticky and attached in the front part of the mouth. The animal shoots the tongue out quickly and catches the prey.

The Common Indian Toad (*Bufo melanostictus*) has no teeth. It has a warty skin from which a poisonous juice comes out when it is pressed. Toes of the fore-limbs are not webbed, and those of the hind limbs are only partly webbed. This toad enters water during breeding season.

The Bull Frog (*Rana tigrina*) on display is leaner than the Common Indian Toad. The head is pointed. The skin is devoid of any poisonous fluid. The fingers of the fore-limbs are not webbed, but the toes of the hind limbs are fully webbed. The Bull Frog's colour varies, giving it different popular names. This frog prefers water to land, for stay. An endoskeleton of the Bull Frog which is generally studied as a type, is also on display.

The Chunam Frog (*Rhacophorus maculatus*) is arboreal and sometimes seen inside the houses, too. It changes its colour. Its fingers and toes have suckers and are partially webbed. The Chunam Frog has a smooth skin above the back and a coarse one under the belly.

The Fat Frog (*Cacopus systoma*) is very lean when dry conditions prevail, but it soon absorbs moisture and becomes quite fat when wet conditions return. It has small and short legs.

Class Reptilia

The reptiles are cold-blooded, air-breathing vertebrates. Some of them possess claws, some others scales, and yet others both claws and scales. They generally lay eggs, but some species give birth to the young. The reptiles are generally sluggish and devoid of long limbs. They shed their skin periodically.

The Reptile gallery begins from where the Fish gallery ends. The reptiles in the Museum belong to three Orders, viz., Squamata, Loricata, and Testudines. The Order Squamata is further divisible into two Sub-orders, the Sauria and the Serpentes.

Order Squamata

(Sub-order Sauria)

Members of the Sub-order Sauria have horny epidermal scales, and comprise the various kinds of lizards. With very few exceptions, they are four-footed animals.

The Common Tree Lizard (*Hemidactylus sub-trederus*) on display in the collections, shows out the length of its sticky tongue with which it catches its prey. It is a spirit-preserved specimen.

The Flying Lizard (*Draco dussumieri*) makes great leaps from tree to tree. Its hind ribs can be expanded resulting in a lateral expansion of the skin on either side. This helps the reptile glide through the air during its long leaps. A specimen showing this expanded skin is exhibited in the gallery.

The Long-tailed Green Calotes (*Calotes versicolor*) is bigger than the Common Garden Lizard. It has a very long tail and (in the males) a mane of well-developed spines. The scales on its back are large and smooth.

The Large Land Monitor (*Varanus varanus*) is the common land monitor of India. Its tail is compressed, and longer than its head and body put together. Nostrils are situated at about the middle of the snout. The specimens in the gallery are of various sizes, and all of them are contained in one sloping case near the window. These creatures can exercise an exemplarily tenacious hold. It is a popular belief that Sivaji's troopers used to scale walls of fortresses making use of these reptiles. The longest monitor lizard in the collection, measures 3 feet in length.

The common Striped Skink (*Mabuya carinata*) is a lizard with a long tail and short limbs. It lives in plains and can very easily climb to a great height despite its weight.

The Indian Chameleon (*Chamaeleon zeylanicus*) has a big bony head which has a crest. Its limbs and the tail are long. Its tail can clasp the small branches and twigs of trees, and aid the reptile in its movements on the trees. This reptile has a rough skin. Its eyes are almost completely covered by the lids except at the centre. It can change its colour according to its moods and surroundings. It is arboreal generally, and moves very slowly. It feeds on insects and has a long and sticky tongue which shoots forth and catches the prey. One specimen in the gallery is in the act of laying eggs, and another shows the full length of its tongue.

Order Squamata

(Sub-order Serpentes)

In the case of the animals of the Sub-order Serpentes the body is elongated and devoid of limbs. It has a covering of horny scales. The Sub-order includes the snakes.

A large chart on display, gives out at one glance the differences in the features of the poisonous and the non-poisonous snakes. In addition spirit-preserved specimens of poisonous and non-poisonous snakes are displayed side by side in one and the same show-case, facilitating easy comparison.

The Indian Python (*Python molurus*) has a drab colour with large and irregularly-oval markings on the body. It is said to attain record lengths of over 20 feet. It is non-poisonous and a favourite of the

snake-charmers and commonly shown round by them. It can swallow whole animals (which may be at times much larger in girth than itself) and digest them. A specimen which is eight feet long is displayed against a beautiful background illustration in a wall-case in the gallery. An egg of the Indian Python is also included in the same wall-case.

Another common non-poisonous snake, *Platyplecturus trilineatus*, which occurs commonly in soft earth, is also exhibited. Though principally a land snake, it can swim short distances in ponds, tanks, wells, etc. It feeds mainly on worms and insect-larvae, and seldom bites. A spirit-preserved specimen is exhibited.

The Red Sand Snake (*Eryx sp.*) is the so-called "double-headed" snake. The tail-end is as stout as the head; hence the popular name. It can be met with in sandy areas. It coils around, constricts, kills and swallows its prey which may be a small mammal, bird, frog or even some other snake. It is viviparous and produces about eight young ones at a time.

The Long-snouted Whip Snake (*Dryophis nasutus*) has a long, pointed snout which has a soft appendage. It is a popular belief that this snake strikes at the eye, though non-poisonous. The exhibit in the gallery is in the act of devouring a lizard.

The Common Cobra (*Naja naja*) is a deadly poisonous snake. It is found in the hills and plains as well. Some species of the cobra have a pair of ocelli joined by a U-shaped mark at the back of the hood which is formed by the loose fringe of skin at the region of the neck. Other species have only U-shaped mark. The principal food of the Cobra consists of rats, mice, frogs and other small snakes. The Cobra is tamed after the fangs are felled out, and commonly shown round by the snake-charmers. Besides a few spirit-preserved specimens showing the expanded hood, there is also a dry specimen which is not exhibited inside a jar, but which looks as if it has come back to life and gained some freedom. A skeleton of the Cobra is also prominently displayed in the posture that is characteristic of cobras. The skull is raised up and the neck vertebrae are stretched side-ways. The poison fangs of the upper jaw, though small in size, can also be seen.

The Common Krait (*Bungarus caeruleus*) has a prominent ridge down the back, and bandings round the body. It has a row of enlarged scales along the middle line of the back. Though poisonous, it is generally inoffensive. In feeding habits these snakes are cannibally.

The Russell's Viper (*Vipera russellii*) has a light-brown colour with a row of black oval-shaped rings along the length of the back. It is a deadly poisonous snake, as its fangs are both large and long. But, fortunately, it is of a sluggish nature. The gallery collections include different species of vipers.

There is also a sea-snake (*Hydrophis spiralis*) exhibited in a jar. It is the deadliest of all the poisonous snakes in South India, and also strong and active.

Order Loricata

Members of the Order Loricata are the crocodiles. The Common Indian Crocodile (*Crocodilus palustris*) which is the most common crocodile in India is very prominently exhibited at the centre of the Reptile gallery. It is oviparous. It lives in rivers, ponds and marshes. Its body is rough without ridges. It has a bony armour which is over-laid by scales, at the back. Though the brain is very small, it is cunning by nature. A full-grown specimen may attain a length of over twelve feet. The specimen in the gallery is arranged in its natural marshy environment. It is shown resting over a shallow pool of water, with its feet on the muddy soil which is overgrown with weeds and over-strewn with molluscs, crustaceans and their remains.

Order Testudines

Turtles and Tortoises come under the Order Testudines. They have a bony shell on the back, into which they withdraw their head and limbs when apprehending danger. Their tail is very short. They are oviparous; and some of them are carnivorous, and some others vegetarians. Some live on land, others in fresh-water, and yet others in the sea. The land forms are known as tortoises, the fresh-water ones as soft shells, and the marine ones as turtles. All these forms and their eggs are represented in the gallery.

The Common Box Soft-shell Tortoise (*Lissemys punctata granosa*) lives generally in fresh waters. It has no plates but is covered with a soft skin all over. It has a flat shell and webbed toes. It is a good swimmer. In feeding habits it is carnivorous. There are different colours in this variety of tortoises.

The Common Three-keeled Land-Terrapin (*Geoemyda trijuga* var. *thermalis*) does not have a very flat shell. It has short, webbed toes. Its colour varies locally.

The Indian Starred Tortoise (*Testudo elegans*) is the ordinary land tortoise of India. It can be found on tropical hills clothed with grass-lands. Its back is covered with a strong shell. Scales on its limbs are prominent. In the cold weather, this animal draws its head and limbs into the shell which has star-like markings on the upper surface. A diorama of this tortoise with a few other reptiles has been arranged near the wall. The area depicted in it, is a small patch of an open, undulating country. The vegetation is semi-arid in nature. There are four Indian Starred Tortoises in the scene, one coming into the open



Fig. 7. DIORAMA OF THE STARRED INDIAN TORTOISE (*TESTUDO ELEGANS*) AND A FEW OTHER REPTILES. THE LATTER HAVE MERGED WITH THE BACKGROUND.

from among a few weathered rocks, another also doing likewise but from among the bushes, yet another seeking shelter under a xerophytic vegetation, and the fourth has taken up its position at the centre of the open spot. A large Land Monitor (*Varanus bengalensis*), is also seen crossing the open space from right to left. There are also two Indian Chameleons (*Chamaeleon zeylanicus*), one (the older specimen) scanning the Museum Visitor (as it were) and the other trying to have a bite at a wasp on one of the branches of a tree. A bluish-green variety of the common lizard lies in wait for the same wasp on the same tree, but on another branch.

The Green Turtle (*Chelone mydas*) is ordinarily found in warm seas. Its muzzle is very short and not pointed at the front. This reptile is much liked as food. It derives its name from the colour of its fat which is green. It lives mainly on sea-weeds, but does not mind if fish and meat are mixed up with the regular diet. The specimen in the collections is a very large one and hails from Tuticorin.

The Hawk's Bill Turtle (*Eretmochelys imbricata*) has a long, pointed muzzle and well-marked beak. Though it is named as a Hawk's Bill, its bill looks more like a fowl's. The shields on the back overlap generally. The eggs of this turtle are good food. The turtle on display is a very large specimen and has come from Tuticorin.

The Loggerhead Turtle (*Caretta caretta*) can thrive well both in Mediterranean and in warm seas. It is very commonly found in the Bay of Bengal. It has a big head with strong jaws. It feeds on other animals, chiefly shell-fish. It is the biggest Chelonian in the collection.

On the wall behind the sloping cases containing the turtles and tortoises, is displayed very prominently the skeleton of a large turtle. The carapace or the outer shell looks like an enlarged shield of the knights of the days of chivalry. The skull, clavicle, and the limb-bones are seen protruding out from under it.

Class Aves

To this Class belong the birds. Birds are warm-blooded vertebrates with two feet and with feathers on the body. The forelimbs of birds are their wings, and the hind limbs their legs. Many of the larger bones in them are hollow, which promotes lightness without loss of strength. There is a tendency for the various bones to fuse with each other for increasing the rigidity of the body. The body of a bird is boat-shaped, to facilitate locomotion through the air. Birds have good vision and hearing. They show parental care in that they build nests, incubate eggs and feed the young. The eggs of birds are generally ovoidal and often

spheroidal in shape. Most of them are whitish, but those that are otherwise coloured, show only light colours. In dimensions they seem to have some kind of proportion to the size of their (respective) birds, but this observation is not always true. Two desk-like, sloping show-cases in the gallery display eggs of a few important birds, facilitating a comparative study. The biggest egg in the collection is decidedly that of the Ostrich, with the Emu's as its close second. The Ostrich's egg measures about six inches along its longest axis. The smallest egg in the collection is that of the Sun-bird, which measures about a quarter inch in diameter.

The nests of birds are also displayed in the gallery. They are arranged in three desk-like, sloping show-cases. The most striking are the nests of the Tailor-bird and the Weaver-bird. They are described briefly further down in these pages.

Birds are classified into several natural orders many of which are represented in the gallery. It will in fact be seen from the account furnished below, that all the natural orders of birds in India, except Hemipodii, are represented in the gallery. A few important exhibits are described below.

Order Passeres or Passeriformes

The Natural Order Passeres is the largest order of birds and includes many a varied form, such as crows, shrikes, tailor-birds, orioles, mynas, fly-catchers, thrushes, weaver-birds, sparrows, swallows, wag-tails, finch-larks, sunbirds, pittas, etc. They all constitute a number of natural families under this single Natural order. To mention a few, a White Crow which is but an albino of the common black form (*Corvus splendens*), attracts many lay visitors. It is a spirit-preserved specimen, exhibited in one of the small wall-cases in the gallery. It has come from Tiruvadanai of the Ramanathapuram District.

The Tailor-bird (*Orthotomus sutorius*) is a small greenish bird which is ever busy like the bee. It inhabits gardens and also the outskirts of towns. It is quite at home with men. Insects and their eggs and caterpillars constitute its food. The popular name of the bird, derives from its habit of bringing together and stitching up the sides of a broad leaf forming a sort of a cup. The stitching is so dextrously done that it does not give way. A flat leaf is thus converted into a sort of a cup-shaped structure. Soft fibres of cotton, wool or vegetable matter are then placed inside this cup, which completes the nest. Both the bird and the nests are also on display in the collections.

The Paradise Fly-catcher (*Tchitrea paradisi*) is a beautiful bird. The male has a white body and a black crest, and a tremendously long tail. These birds live on insect diet.

The Common Weaver-bird, known also as Baya (*Ploceus philippinus*) flocks in the open cultivated areas, and causes depra-dation to the cereal crops at the time of harvest. They build their nests on the Babuls or on the low palms in the vicinity of paddy and other crops, and hanging over some stagnant water (including wells). The male bird does the nesting which is flask-shaped with a long neck, and which is woven of strips of blades of grasses. The female bird joins the male only at the time of "furnishing the home." After the eggs are laid, the male builds another nest and takes a second mate. The female birds alone incubate their eggs, and feed their young.

Order Pici or Piciformes

The Natural Order Pici includes such birds as the Wood-pecker, and Coppersmith. A specimen of Coppersmith (*Xantholaema haemophala*) is very attractively displayed in a separate show-case. It is an arboreal barbet of various colours, the green predominating. Its call sounds like the metallic noise produced when beating a copper-vessel with a hammer. It is heard frequently in groves and large gardens. It feeds on small, wild fruits, generally of the type of the Banyan fruits. A small hole in the bough of a tree serves as the nest. It may run into the tree, by a few feet.

Order Anisodactyli or Coraciformes

The Natural Order Anisodactyli is also represented in the gallery. The Blue Jay (*Coracias benghalensis indica*) is an interesting bird with a beautiful plumage. It is a blue bird with brown, black and other colours making a fine combination. It avoids thick jungles and frequents the cultivated tracts only. It feeds on crickets, grasshoppers, beetles, mice, lizards, frogs, etc., and thus serves the farmer. It makes a variety of loud calls during courtship. Holes in buildings or hollows of rotten trunks of trees are the venues for nesting. The feathers of this colourful bird are very attractively spread out and conspicuously displayed in a wall-case at the farther end of the bird gallery.

The Hoopoe (*Upupa epops*) is another interesting bird of this order. It is fawn-coloured and its back, wings and tail have white and black designs, and its crest is tipped black. Scattered pairs or (sometimes) families of these birds may be seen on the ground overgrown with low vegetation. The Hoopoe has a beautiful crest which is spread out, when excited. The female bird does not generally leave her nest and the male acts as the bread-winner.

The Great Hornbill (*Dichoceros bicornis*), another member of this order and an exhibit in the gallery, never fails to arrest the attention of the visitor. It is a fairly large bird with an over-prominent, large, stout and much-curved bill. It has a broad casque which covers the head and the base of the bill, and which has a pair of projections in front. It is a bird of the Western Ghats. It flies with a droning noise, and is boisterous while at rest. It uses its bill as a pickaxe. It is omnivorous but prefers fruits to other diet. Its mode of feeding is peculiar. The prey is thrown up and swallowed when it comes down. Eggs are laid in tree-holes.

A green and smaller variety of the Hornbill can be seen in one of the vertical cases containing the parakeets. This specimen (*Pteroglossus sp.*) is of a delightfully bluish green colour, and has a prominent bill. The mandible is coloured black, and the maxilla partly black and partly yellow. The edges of the mandibles are dentate like a hand-saw. The specimen hails from Columbia.

Order Macrochires or Caprimulgiformes

This natural order is illustrated by the Common Indian Nightjars which are grey, brown or buff-coloured birds with soft plumage. There are white patches on the wings which are seen only when the bird is on its wing. The Nightjars are nocturnal and spend the day resting on the ground under the cover of some bush. They fly silently and can twist or turn very sharply to avoid obstacles. They feed on beetles, moths, etc., and take no pains to build a nest. Eggs are laid on the open ground under a bushy cover. The Nightjars are exhibited in the show-case containing the owls at the entrance to the birds gallery.

Order Coccoyges or Cuculiformes

The Natural Order Coccoyges is comprised of such birds as the cuckoos, koels, etc., all of which are on display. Of them the Common Hawk Cuckoo (*Hierococcoyx varius*) is an interesting specimen, while the Indian Koel (*Eudynamis scolopaceus*) is only too well known. The former is remarkably similar to the hawks in appearance. It is an arboreal bird and sends out its characteristic notes from the top of a tree. It feeds on berries, insects and hairy caterpillars. It lays its eggs in other birds nests, like the Indian Koel.

Order Psittaci or Psittaciformes

To the Natural Order Psittaci belong the parakeets and lorikeets. Both these kinds of birds are included in the exhibits. They have a beautiful plumage and are often the attractions even in a collection of live birds in zoos and gardens. They are fruitivorous birds with an arbo-

real habit. Since these birds are so common and so well-known, no detailed account is needed in these pages.

Order Striges or Strigiformes

The Natural Order Striges includes the owls and owlets which are all nocturnal, only stray ones appearing here and there during day. These specimens make a prominent group in a small vertical show-case near the entrance.

The Brown Fish Owl (*Ketupa zeylonensis*) is as big as a Pariah Kite. It has large blinking eyes; hence the phrase "blinking like an owl." It is a nocturnal bird, and feeds mainly on fish, crabs, and small mammals, birds and reptiles. It nests in the hollows of tree-trunks. The Indian Great Horned Owl (*Bubo bubo*) is also of about the same size as the Brown Fish owl, and nocturnal in habit. Its legs have a complete covering of fulvus feathers. It feeds on small mammals, birds, lizards, fish and crabs. This bird is also of economic importance to the farmer, as it keeps down the field rats and mice. It does not build any nest, but lays eggs under the cover of a bush and on level ground.

Order Accipitres or Falconiformes

To the Natural Order Accipitres belong the vultures, eagles, kites, harriers, shikras, etc. These are adequately represented in the gallery. A collection of four specimens of vultures in a separate show-case near the Geology gallery, offers a close-up view of these birds which fly in very high altitudes.

The Bengal Vulture (*Pseudogyps bengalensis*) is a dark, heavy vulture. There is a prominent white patch on the back, near the tail. The wings have a white band on their under surface, which is revealed in flight. They are able to spot out the dead and decaying bodies on the ground, even when soaring at high altitudes. They feed on the carcasses and clean up the ground in quick time.

The White Scavenger Vulture or Pharoah's Chicken (*Neophron percnopterus*) has a yellow head and bill, and wedge-shaped tail which helps identification when the bird is in flight. It feeds on night-soil and other refuse around villages and other habitations. In some South Indian Hindu temples, these birds are considered sacred and fed regularly once a day.

Among the eagles in the gallery, the Short-toed Eagle (*Circaetus ferox*) is of great interest. The head is large. These birds too fly at very high altitudes. They feed generally on snakes and lizards, and some times on whatever small helpless animals (eg., frogs, fish and small birds

and mammals) that may come in their way. The wing-spread of this eagle is very prominently displayed in a separate show-case in the gallery.



Fig. 8. SHORT-TOED EAGLE SHOWING ITS WING-EXPANSE.

The specimens of the Black-winged Kite (*Elanus caeruleus*) are interesting in the gallery, for their colouration. They are not really so black as their names suggest. The expanse of their wing-spread is also clearly shown.

Order Columbæ or Columbiformes

Pigeons and doves that comprise the Natural Order Columbæ are adequately represented in the gallery. These common and well-known birds are seen in the large vertical show-cases behind the exhibit of the Great Hornbill.

Order Pterocletes or Pterocleteformes

The Natural Order Pterocletes consists of the sand-grouses, a specimen which is also on display in the gallery. These birds cannot alight any where except on ground. The male birds supply water to the young. Hollows on the ground and under low bushes, form the nests.

Order Gallinae or Galliformes

This natural order includes the fowls, pheasants, quails and partridges. It is also given the representation, its due, in the gallery. The Grey

Jungle Fowl and the Pea Fowl require a special mention. The Grey Jungle Fowls (*Gallus sonnerattii*) can be seen in the forest tracts on hills and in plains. It feeds on grains, shoots and berries, as well as on termites and other insects. The cock crows in the early mornings and evenings.

The Common Pea Fowl (*Pavo cristatus*) can be seen in forest tracts on the plains and low hills. The upper tail-coverts are very long and beautifully ocellated. These birds move in flocks to the water-side during day-time. They are heavy and fly only occasionally. When they fly they gain speed with distance. Grains, insects, and small reptiles form the diet of these beautiful birds. They observe polygamy, the cock maintaining a harem of four or more hens. The plumes of these birds are so varied, beautiful and attractive, especially in the male, that they often supply subjects to artists. There are two specimens of Pea Fowl, one male and the other female, exhibited in a large show-case at that end of the birds gallery, which is nearer the Geology gallery. The Peacock has recently been declared the "National Bird of India."

Order Grallae or Gruiformes or Ralliformes

The Natural Order Grallae includes the water-hens, coots and cranes. The White-breasted Water-hen (*Amaurornis phoenicurus phoenicurus*) in the gallery deserves a special mention. It is a marsh bird with a stub tail, a pair of long legs and a white face. It haunts the reed swamps in the plains. It feeds on insects, molluscs, seeds, etc. The water-hen is generally silent except during the breeding season, when it makes a loud noise. The nests are superficially built on the level ground near the water and in the middle of reeds and other vegetation.

Among the cranes, the exhibit of Demoiselle Crane (*Anthropoides virgo*) is of special interest. It fills up a large, separate show-case and appears to keep a careful watch on the passers-by. It measures three feet in height. The ears have conspicuously white tuft-like feathers. These birds pay seasonal visits to the Indian Plains from abroad. They feed on cold-weather crops like wheat, gram, etc. While the flock is at feed, a few birds stand sentinel and sound away the alarm note even on the slightest disturbance.

Order Charadriiformes

The Natural Order Charadriiformes comprises such birds as the lap-wings, plovers, pipers, greenshanks, snipes, stilts, curlews, gulls, terns and skimmers. The exhibit of the Little Ringed Plover (*Charadrius dubius*) is interesting. It has a stout bill, and long legs which are rather naked. In colour, it is brown above and white below, with a white neck and a black ring around it. This bird frequents damp

and muddy areas in the open. It drums with its toes, dislodges insects and picks them up with a characteristic movement. It lays its eggs on dry sand-banks.

The Curlew (*Numerius arquata*) is a wading bird. The bill is long, pointed and curved downwards. It is out of proportion to the head, neck or body. It can be seen during the winter months at the river-sides and marshes. During the other parts of the year, it remains abroad. It feeds on small Invertebrates and vegetable matter. It does not build nests, but lays eggs in the hollows in waste lands and marsh lands.

The Black-winged Stilt (*Himantopus himantopus*) is a marsh bird with a black, slender, straight bill. The exhibit looks as if it is really on stilts. Its legs are far too long and are responsible for the appearance and the popular name. It is generally seen standing in shallow waters, tanks, etc. It feeds on aquatic worms, seed plants, etc. It can walk, run or swim well. The brooding birds do not generally fear men.

Of the gulls, terns, and skimmers, there is only one specimen in the gallery, and that is the Common River Tern (*Sterna aurantia*). It is exhibited in one of the vertical cases. This bird changes its plumage in summer and winter, and being a water-bird, shows also aquatic adaptations. The specimen on display is in its winter plumage which consists of a dull grey colour on the back and upper surface of the wings, and of a white colour under the belly and the under-surface of the wings. The crown of the head is covered by a black patch. In summer the birds develop black and green colours. This bird has a long bill, a forked tail and webbed toes. It catches fish in rivers, making a sudden swoop for the purpose, takes the prey into the air, and during flight, swallows it. It does not build nests, but lays its eggs in depressions in sand.

Order Steganopodes or Pelicaniformes

Birds like the pelicans, cormorants and darters belong to the Natural Order Steganopodes. The Spotted-billed Pelican (*Pelicanus roseus*) is interesting for its bill. It is a big water-bird with a long neck, short and sturdy legs, webbed toes and a long and flat bill. The upper portion of the mandible has large blue-black spots. A large skin bag dangles from below the bill. Swamps are the favourite haunts of these birds which keep swimming about and fishing, or merely drifting idly about on water. When they fish they keep their bill open, the lower jaw dipping in water and the skin-bag serving as a sort of a "drag net." The pelican's fat is said to be used in medicine. This bird builds its nests on tree-tops.

A couple of Indian Darters or Snake-birds (*Anhinga melanogaster* or *Plotus melanogaster*) are interesting in the gallery, for their shape. This is also a water-bird like the pelican. It has an S-shaped long neck, and a small head with a dagger-like and pointed bill. Its favourite haunts are the rivers, tanks and back-waters. It is so fond of water and such an adept in diving, that it spends most of its time only in water, the long, thin neck and head alone sticking out of the water-surface. Its feeding habit is interesting. It spears fish with the pointed bill, wades on to the surface, tosses up the prey into the air, and then receives it between the beaks. The darter associates itself with the other water-birds in respect of its other habits.

Order Herodiones or Ciconiiformes

The Natural Order Herodiones consists of the Spoon Bills, storks, egrets and herons. They are all well represented in the gallery. The Open Bill (*Anastomus oscitans*) is a white stork with blackish wings. The mandibles curve out at the middle and meet again at the ends, thus leaving a narrow gap between them. It feeds on molluscs, snails, etc., and inhabits marshes.

The Spoon Bill (*Platalea leucorodia*) is a marsh bird, white in colour, and has a long neck and long black legs. The bill is black, broad, thin, flexible and spoon-shaped with yellow colour and bulbous tip. It can be seen in groups (sometimes alone) with other similar species. It takes rest during the after-noons and goes in search of food in the evenings. These birds feed on small amphibians, molluscs, insects and vegetable matter. They work in groups to find their prey. They nest in colonies. They build their nests with sticks on tops of trees near river-sides, and carry out annual repairs to them. The bill of the young bird is somewhat different from that of the adult.

The Grey Heron (*Ardea cinerea*) is as big as the Open Bill. It has long legs and a dagger-like bill. A long, black crest is there at the back of the head. This bird is normally seen singly near tanks, rivers, streams, etc. Sometimes it stands still in knee-deep water as if asleep and waits for the prey (fish, frog, etc.) to come nearer. It is so very quick and alert in its movements, that the victim cannot escape once it is within the bird's reach. It is partly nocturnal and feeds on fish, frogs, aquatic insects, small mammals, etc. When flying, the head is drawn and kept in between the shoulders, in a manner that is typical of these birds. The Grey Heron nests usually in company with colonies of cormorants, egrets, etc.

Order Anseres or Anseriformes

The Natural Order Anseres comprises of the teal, ducks, pochards, etc. These are adequately represented in a number of show-cases in the

gallery. The tallest bird in the gallery is a member of this order. It is the Common Flamingo (*Phoenicopterus flamingo*) which can never fail to catch the eye of the passing visitor. In its full height, it tapers 4 feet. Its colour is white. Its bill is rather peculiarly turned down at a sharp angle at the middle. Its tongue is thick and fleshy. The toes are webbed. This bird feeds on tiny Invertebrates and vegetable matter in lakes and marshes. It stands only on one leg when resting. It builds conical mounds of wet mud and scoops slight depressions at the tops. These mounds become hard on exposure to sun, and then serve as the nests. In the gallery, the thick and fleshy tongue of this bird, is also separately displayed.

Order Pygopodes or Podicipiformes

The Little Grebe (*Podiceps ruficollis*), the only bird of the Natural Order Pygopodes is also exhibited in the collections. It is a water-bird with a silky and water-proof plumage. Its legs are compressed and have broad lateral lobes. The bill is compressed and sharply pointed. This bird swims in water, and when threatened, dives into it and disappears. It is one of the most highly specialised birds for aquatic life. It lives on fishes. Its nests which are built of water-weeds, generally float on water. The young ones swim out as soon as the eggs are hatched.

DIORAMAS

No account of the Bird gallery can be closed without a mention of three beautiful dioramas that adorn the gallery. One of them is the diorama of the White-breasted Water-hen (*Amaurornis phoenicurus*). It is one of the finest-arranged exhibits in the gallery, and can be seen in a show-case on the verandah. The natural haunts of these birds are so well depicted in it. A couple of the White-breasted Water-hens are shown standing near a water-edge. The stagnant sheet of water is so clear that the bottom of the pool is also clearly visible. The banks are moist and overgrown with reeds, in the midst of which the shells of aquatic animals are seen scattered about. The birds are shown looking longingly at the water, for their prey.

The other diorama depicts a few common birds whose ways, however, are not so commonly known. The birds are shown in their favourite and common postures. Since they are too many and so widely varied, it is not possible to describe them even briefly. They can however be easily identified or recognized by comparison with other specimens elsewhere in the same gallery.

The yet other diorama is that of ducks, and pipers and plovers. It presents these birds in their natural environs consisting of small islands



Fig. 9. DIORAMA OF COMMON BIRDS.

in a large lake. The islands are over-grown with grasses. A couple of ducks are shown swimming on the surface of water, while two others are perhaps ready to take their chance. A couple of plovers and a couple of sand-pipers are watchfully looking at the water. Another sand-piper is about to insert its beak into the water, having sighted a prey, perhaps.

AVIAN SKELETONS

At the far end of the Bird gallery, a couple of show-cases contain skeletons of a few select birds. The skeletons *in situ* of each of the Jungle Crow (*Corvus macrorhynchos*), the Pelican (*Pelicanus sp.*) the White Scavenger Vulture (*Neophron percnopterus*) and the Cock Fowl (*Gallus sp.*), besides the bones of different isolated parts of birds, form these collections. A comparative study will be found interesting. They show adaptations to different habits. The Cassowary, for instance, is a running bird; the Water-hen is a wading bird. The breast-bones of these birds differ structurally. In the same way, other comparisons can be made in the gallery.

AVIAN BEAKS

Heads of eighteen different birds with their beaks intact are well arranged and displayed in a small wall-case. They go to illustrate the adaptations in birds to their feeding habits. The duck for instance has a broad, flat bill suitable for retaining inside it the aquatic worms, insects and grubs and expelling water at the same time. The heron which feeds on small fish and frogs, has a long, pointed beak. The fowl has a stout and strong bill for crushing husks of grains and shells of animals. The parrot has a very strong and sharply curved beak with which it is able to crack nuts or climb branches of trees. The sparrow has a short, strong, conical beak for cracking husks of seeds. The wood-pecker has a long, chisel-shaped beak for cutting into barks of trees. The kite has a strong beak, the upper mandible ending as a curved and pointed hook, which is an adaptation for feeding on meat and other birds.

AVIAN FEET

The feet of eighteen different birds are arranged and displayed in another small wall-case. They go to illustrate the adaptations in birds to their modes of locomotion and feeding. The toes of duck for instance are webbed for use as paddles while swimming in water. Those of heron are long and slender and facilitate overcoming aquatic resistance and wading in water. Those of fowl are both long and sturdy enough to scratch the earth in search of prey. Those who have seen cock-fights, may remember how furiously the cocks scratch the earth during an attack. The feet of all perching birds are similar in pattern.

though different in size which is but proportionate to the bulk of the body. They have three toes in the front and one in the rear, the latter opposing the former. The parrot, a climbing bird, has two toes in the front and two in the rear, so as to facilitate holding the branches firmly when climbing. The talons of birds of prey need no special account.

Class Mammalia

Mammals are those animals which suckle their young. They also have generally a hairy covering. The Indian species of mammals are divided into eleven natural orders. In the Museum, all these orders, except the Perissodactyla (which have their limbs ending in odd-toed hoofs), are represented. The Mammal gallery can be treated as consisting of the Mammal gallery proper, and the mammalian skeletal gallery. Since the latter is but a subsidiary of the former, both these galleries are referred to together in these pages.

Order Pholidota

The Pholidota have paws with claws and a scaly covering for the body. They have no teeth since they do not feed on anything hard which requires biting.

To this natural order belongs the Indian Pangolin (*Manis crassicaudata*). It is also known as the Scaly Ant-eater because of its armour of overlapping scales. The animal lives in burrows which it makes with the help of its somewhat curved and blunt claws. It is nocturnal in habit and finds its prey by the keen sense of smell. It can climb trees, like bears. Its food consists of the eggs, young and adults of termites and ants. The Pangolin has a sticky tongue which darts out and gets back with the prey in an instantaneous movement. Two entire specimens of this ant-eater which looks more a reptile than a mammal, are also on display in the Mammal gallery.

Order Cetacea

The Whales of our seas and elsewhere, belong to the Natural Order Cetacea, and have a fish-like body and thick skin. In the gallery there is the skeleton of a Balaen Whale (*Balaenoptera indica*) which was sixty-two feet long when in life. The size of the shoulder-blades and mandibles never fails to extract admiration from one and all. These whales are the largest of the known animals, some of them attaining a length of even 100 feet. Their food consists chiefly of micro-organisms and small fishes and crustaceans, which is in contrast with the size of the jaws. The whales are all marine and have aquatic adaptations. The skeletal remains on exhibition are those of the whale which was washed ashore near Cuddalore in 1955. Its mandibles are seventeen feet long, and prominently and imposingly displayed in the (main) Mammal Gallery.

Order Proboscidea

This order includes animals which have the nose and the upper lip elongated to form a strong muscular proboscis (or tube) with the nostrils at its tip. The incisors are modified to form tusks.

The Indian Elephant (*Elephas maximus*) belongs to this order. It is a herbivorous animal. A number of these animals live in herds, each herd constituting one single family. They have tusks which are long in males and short in females, and which are prized very highly. Elephants themselves are extremely useful when tamed. They are noted for their august appearance and measure of strength. In the Museum, they are represented only by their skeletons. The skull of the elephant is the largest in the collection of mammalian skeletons. The size of the grinders (teeth) is rather astounding. The feet of elephants are also exhibited. Though all the five toes are present, they are united together forming a single pad. The fore-foot is larger and more round, while the hind-foot is smaller. The latter has four nails while the former has five.

Order Artiodactyla

The animals comprising the Artiodactyla, have their limbs ending in even-toed hoofs. They are all herbivorous in their feeding habits.

The Indian Wild Boar (*Sus cristatus*) lives in herds which are led by a chief (boar). Stray wild boars are those that are driven out from the herds, and are dangerous to be encountered. They are of a strong build and are furious when enraged. A specimen of the lower jaw of the Indian Wild Boar is on display along with the other mammalian skeletons.

The common sheep and goats also belong to this natural order. There are two specimens of foetus of sheep (*Ovis sp.*), preserved and displayed in spirit. One of them is 2½ months old, and the other 3 months old. In addition, dissected specimens showing the sheep's heart with major blood vessels, kidney with ureters, and liver with gall-bladder, are also on display. Included in the mammalian skeletal collections, is the skull with horns of the Marcopolo's Sheep (*Ovis amon poli*). It is found in Central and Northern Asia at high altitudes. It is the largest of the known varieties of sheep. The horns have a characteristic curvature.

A skull with horns of the Nilgiri Tahr (*Hemitragus hylocrius*) is displayed on the wall. This animal is a near relative of the goat, and an inhabitant of the Nilgiris and Western Ghats at a height of 4000-6000 ft. above mean sea-level.

The Indian Gazelle or Chinkara (*Gazella bennetti*), another beautiful member of this order, lives in plains and low hills, making flocks or

herds. This is a wonderful animal in that it can live without water for a number of days. Its skull with horns is on display.

The Black Buck or Indian Antelope (*Antelope cervicapra*) is a beautiful animal with long and wonderfully-twisted horns. The Black Buck is known not only for its beauty, but also for its speed. Being a favourite of the sportsmen, this animal is now getting scarce, if not extinct, in the areas where it once used to occur in abundance. The Nilgai or Blue Bull (*Boselaphus tragocamelus*) is another beautiful antelope. It feeds throughout the day, and despite its size, can run very fast. The biggest skeletons *in situ* in the mammalian skeletal gallery, are those of the Black Buck and the Nilgai. The entire skeleton of the Four-horned Antelope (*Tetraceros quadricornis*) is also included in the mammalian skeletal gallery.

The Gaur or Indian Bison (*Bos gaurus*) which is a herbivorous animal in the dense forests of the Mysore and Madras States, is represented by its skull (with horns) in the mammalian skeletal gallery.

There are also seven skulls (with horns) of the Indian Deer in the collections. The Sambar or Rusa Deer (*Rusa unicolor*) has its entire skeleton represented in the gallery. This animal lives in the hilly forests in South India. Only the male of this species develops the horns, and also sheds them periodically.

Order Carnivora

The Carnivora have paws and well-developed canine teeth which are a special adaptation for the flesh-eating habit. They are fairly well represented in the gallery. One of these representatives is the Jungle Cat (*Felis chaus*). It inhabits generally grass-lands, scrub-jungles and banks of streams. It moves like a leopard and preys on small mammals, birds, etc.

Another member is the Leopard Cat (*Prionailurus bengalensis*). Two specimens of this animal are exhibited in the gallery. It is nocturnal in habit. It is found on grass-lands, scrub-jungles, etc. It can climb up spreading trees, the hollows of which often form its home.

The Leopard or the Panther (*Panthera pardus*) lives not only in forests but also on rocky places. The leopard makes a meal of anything that could be over-come. Large rodents, sheep, monkeys, small deer, etc., form its easy food. Large deer, cattle, and smaller wild beasts also constitute its diet. The leopard is a terror in the forest since it can climb trees. Bigger animals like buffaloes, Nilgai, etc., are too strong for the leopard. In its turn the leopard dreads the tiger. In an encounter with a pack of wild dogs, hyaenas, etc., the leopard is helpless.

A small leopard cub is on display in the gallery, so also are a couple of heads of grown up leopards. In addition there is an entire skeleton of a leopard and an isolated skull of the same in the mammalian skeletal gallery. The entire skeleton belongs to a leopard that was bagged at Tiruvarangulam near Pudukkottai.

In the gallery two specimens of the Small Indian Civets (*Viverricula indica*) which are popularly known as civet cats are also exhibited. Many of these civet cats live around villages and are nocturnal. The civet cat preys on small rodents, birds, reptiles and insects. Vegetable dishes like fruits, roots, etc., sometimes go to provide variety in its meal. This animal can be tamed and a scent from its scent-glands extracted. It can climb tall vertical trees but prefers to hunt on the ground.

The Common Palm Civet or Toddy Cat (*Paradoxurus hermaphroditus*) spends its time generally on trees, preferably palms and mango trees. Fruits, small mammals and birds form its food. It is generally nocturnal, hiding in trees or drains and coming out only in the nights. The town-dwelling palm civet feeds on rats, mice and poultry. It climbs palm trees and steals the palm juice under tapping. It can be easily domesticated as a house-hold pet. A diorama of the palm civet in the Museum is very interesting. It shows these animals (*Paradoxurus hermaphroditus*) in their natural poses. One of them is up on a palm tree and the other perhaps looks out for another palm. Introduction of the natural environs in the setting, enhances the value of the exhibits considerably.

The Common Mongoose (*Herpestes edwardsii*) inhabits open lands. Its general shelter may be trees, hedges, tree-cavities, etc. In townships, the mongooses live in the masonry crevices and drains. The mongooses are often seen running across the open, either in family parties or as solitary individuals in small towns. They prey on rodents, reptiles, amphibians and insects. They do not mind a little vegetarian diet. In towns they are destructive to poultry. They have a strong antipathy to snakes, and battle and kill them. They can be petted at home for the destruction of rats. The gallery collection includes the mongooses also. One of the specimens is shown grappling with a cobra.

The Indian Jackal (*Canis aureus*) can live in a variety of environs ranging from deserts to rainforests. It hides itself in burrows and scrub, during day, and prowls about during night. It may hunt its prey alone, or a large number may join together as a team which is called a pack. Unlike its cousin, the Wild Dog, a jackal prefers an easy meal if one could be had either in a carcass or in fallen fruits. The gallery contains a whole specimen and a skull of this common but little known animal.

The Wolf (*Canis lupus*) is another species of the same genus. It is represented in the mammalian skeletal gallery by an entire skeleton *in situ*.

The Indian Fox (*Vulpes bengalensis*) is also included in the exhibits. Many foxes live around cultivated lands, hiding in burrows and feeding on small mammals, reptiles and insects. They destroy rats and are therefore helpful to the farmer. When sweet fruits could be had without much effort, the foxes turn vegetarians.

Among the several bears in the Country, the Sloth Bear (*Melursus ursinus*) is the one that is occasionally met with in the Pudukkottai area. The bears are generally prone to run away from, rather than enter, any conflict. They feed on fruits, honey and insects normally, but do not mind flesh if it could be had at a hungry moment. The bears can be tamed and trained to do tricks. The mammalian skeletal collections include a skull of this sturdy and grisly beast.

The Smooth Indian Otter (*Lutrogale perspicillata*) is smooth all over and brownish black in colour. It lives mainly at the borders of the lakes and streams. Its main food is fish, but it eats also whatever it can kill. It hunts fish, even going far out into the open sea. When pools and tanks dry up it hunts in jungles like other carnivorous animals. The Smooth Indian Otters are adapted equally both for aquatic and for terrestrial life. When fishing, the otters join together and form a team. A specimen of this species is prominently displayed in the gallery.

Order Rodentia

The Rodentia have a pair of large incisors in front of each jaw. The canine teeth are absent and there is a large space between the incisors and the grinders. This space is known as diastema.

The natural order comprises such mammals as the squirrels, rabbits, rats, bandicoots, mice, porcupines, etc. All these have their representations in the galleries. Of them all, a special mention may be made of the Large Brown Flying Squirrel (*Petaurista phillipensis*), the Indian Giant Squirrel (*Ratufa indica*), the Indian Porcupine (*Hystrix leucura*), the Indian Gerbille (*Gerbillus indica*), and the Guinea Pig (*Cavia aperea*).

The Large Brown Flying Squirrel lives in forests and moves about only at nights. It takes shelter in tree holes and dense growth of branches. Its limbs are connected by a flap of loose skin from the sides of the body, which serves as a parachute when the animal takes long leaps. When this rodent sleeps, it lies on its back and keeps its legs and webs spread out. It is mainly herbivorous, but does not mind an insect meal if it is mixed up with the regular diet. The specimen in the gallery shows the expanse of the parachute-mechanism.

The Indian Giant Squirrel lives in all kinds of forests, provided there are good many trees (deciduous or evergreen). It leaps from tree to tree, sometimes covering as much as twenty feet of horizontal length in one leap. On seeing anything unusual in the forest this squirrel sends forth its alarm calls in all directions. It builds several nests on different trees for different purposes, such as bed-room, nursery, etc.

The Indian Porcupine is nocturnal in habit and lives in burrows near tank bunds and water-courses. The rear part of the back and the upper part of the sides have a covering of long, sharp-pointed, erectile spines which harden with age. When irritated the animal erects these spines, rapidly turns about, and makes a dash in the reverse direction. The spines of porcupine are much better developed than those of any other mammal. A tiger attacked by a porcupine is generally disabled. Tubers constitute the chief food of the porcupine. The flesh of porcupine is considered a dainty for the table. The porcupine is now a rare animal in the neighbourhood of Pudukkottai.

The Indian Gerbille is much like the rat; but it has a hairy tail ending in a tassel. The hind legs are very long. This mammal lives in burrows near cultivated fields. The males and females live in separate burrows which have single and double entrances respectively. They are active only after dusk. They feed on grains, roots, leaves and grass, and are destructive to cultivation. They have the tendency to store food for the drought season. They also feed on insects, eggs and smaller rodents.

Besides these and several other rodents, there is also a Guinea Pig (*Cavia aperea*) among the exhibits. Their popular name is a misnomer, since they are not pigs. The Guinea Pigs are prolific in breeding, and are therefore extensively experimented upon by scientists.

Order Lagomorpha

Rabbits, hares, etc. belong to the Order Lagomorpha. They have two pairs of incisors in the upper jaw. Their upper lip shows a median division into two lobes which are however interconnected by a thin skin.

The Common Indian Hare (*Lepus nigricollis*) is brownish yellow in colour and has longer ears and limbs, in contrast with the Wild Rabbit (*Orytolagus cuniculus*) which is white in colour and has shorter ears and limbs.

Order Insectivora

The Insectivora have a long snout which protrudes beyond the mouth.

This natural order has in its fold the South Indian Hedgehog (*Paraechinus nudiventris*), the Grey Musk Shrew (*Pachyura caeruleus*), etc. These are accommodated in the tall vertical cases in the gallery. The Hedgehog moves in the nights and spends its day in holes and burrows. It lives on insects, worms, mice, etc., and also takes to fruits and roots at times. It has a spiny coat. When alarmed, it rolls itself into a ball and shoots up its spines which harden with age.

Order Chiroptera

The Order Chiroptera is the natural order to which the bats belong. The members have an extreme elongation of the finger-bones supporting a wing-like web. The Flying Foxes (*Pteropus medius*), the Sheath-tailed Bats (*Taphozous melanopogon*), the Long-tailed Bats (*Rhinopoma microphyllum*), the Hairy-winged Bats (*Harpyiocephalus harpyia*), the Schneider's Leaf-nosed Bats (*Hipposiderus speoris*) and the Indian Vampires (*Megaderma lyra*) make up the collection of bats in the gallery. Of them the Flying Foxes and the Vampires call for a special mention. The former are fruit-eating bats that fly about at fairly good height in the nights. They belong to the tropical countries of the



Fig. 10. DIORAMA OF THE FLYING FOXES.

Old World. They inflict enormous damage to fruit-gardens in India and Australia. Thousands of them are seen clinging head downwards,

to the branches of a common tree. There is a wonderful diorama of the Flying Foxes in the Museum. It depicts a number of these fruit-eating bats dangling head downwards from the branches of a fig tree near the shore of a lake. A fruit-eating bat of the same species is shown gliding down in the air, towards the same tree. Down below, on the ground and near the fig tree, is a fresh-water swamp.

The Vampires are carnivorous bats and carry away rats, mice and lizards. The Indian species are not so harmful as the true Vampires which are inhabitants of the New World, and which bite off even horse's flesh. There is also an entire skeleton of a bat, showing the length of the bones of the digitals that support the wing-like web.

Order Primates

The Natural Order Primates is the highest evolved, and includes even man. The members are recognised by the opposable first toe in their limbs, particularly the fore-limbs. In the gallery they are represented by the Common Langur (*Semnopithecus entellus*), the Bonnet Monkey (*Macaca radiata*) and the Slender Loris (*Loris tardigradus*).

The Common Langur is not so commonly met with as its name suggests, in the Pudukkottai area. It has got long limbs and long tail. It is arboreal and does not normally come down to the ground. Being held in great veneration by the people, it does not fear them.

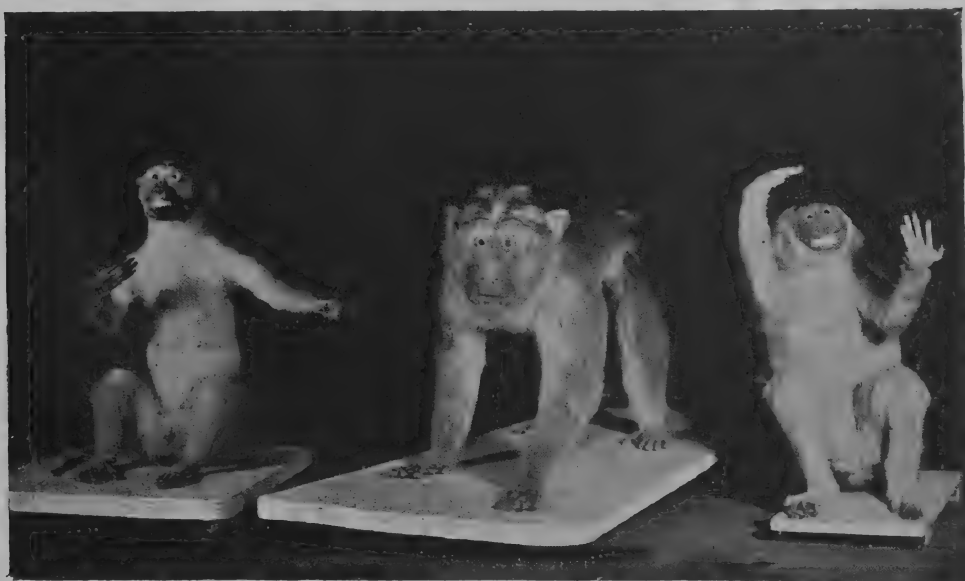


Fig. 11. A GROUP OF MONKEYS (THE COMMON LANGURS WITH THE BONNET MACAQUE AT THE CENTRE).

It is more respectable however than the Bonnet Monkey, both in appearance and in "monkeying business." Its dread enemy is the leopard.

These monkeys may go about in assemblages in which the males, females and immatures may all be present, or in which only one adult male and his harrem with the young may be present, or in which only the males (driven out by more powerful rivals on attaining maturity) may be present. The Bonnet Monkeys also live in family groups. Though arboreal in habit they feed at the ground also. Those in towns and villages do not fear men.

The Slender Loris is nocturnal in habit, and lives in forest areas or in open countries with plenty of trees. While it feeds on anything it can get, it has a partiality to the Lantana berries. It usually remains single, but sometimes moves about with a mate. These animals are peculiar to South India.

The skeleton of an Anthropoid ape is seen separately exhibited in the mammalian skeletal gallery. It has a close resemblance to the skeleton of a human child.

FREAKS

Alongside these exhibits a few freaks of nature have also been put on show. Though they do not carry much of any scientific importance, their inclusion has been deliberately arranged for, in the hope that they would help the Institution attract the general masses so that its educational services could be fully utilised. Some of these exhibits are four kids having a single head and divided body, a kid with five legs, a double-headed calf, buffalo twin, and a young pig with proboscis.

Economic Products Section

The Economic Products Section as it stands today, is essentially an Agricultural Section. It includes also a small nucleus collection for a Botany gallery, the organization of which is under the active consideration of the higher authorities. Exhibits in the Economic Products Section are grouped under Plant Morphology, Cereals, Oil-seeds, Tea-culture, Timbers, Fibres, Fertilizers, Agricultural Implements and Fungal Diseases of Plants.

PLANT MORPHOLOGY

Morphological features of plants are illustrated in a number of attractive pictures (some of them in colours) that are displayed on the wall. Special mention may be made of the different kinds of fruits and seeds showing special adaptations for their dispersal.

A bunch of pods and seeds of *Andenantha pavonina* is very prominently displayed in a separate show-case. They are dry dehiscent fruits which burst with force and throw the seeds farther away from the plant. The seeds too are bright red in colour and are dispersed by birds which are attracted by them. Dry dehiscent pods with more attractive seeds in them, are seen in the case of the plants of *Abrus precatorius*. These seeds are almost similar to those of *Adenantha pavonina*, but with the difference that they (the former) have a black dot which is rendered very conspicuous by the bright red background.

There are also specimens of fruits on display, showing special adaptations to their dispersal by such agencies as winds, animals, etc. A few of them are worth noting here.

In the cases of dispersal by wind, the lighter seeds need no special development, but the heavier ones need some. In the latter case, either the seed or the entire fruit produces wing-like structures for parachuting in the air. These wings are of different forms in different plants.

The seeds of *Wrightia tinctoria*, for example, are hairy or comose, and contained in a cylindrical follicle. When the follicle dehisces, the seeds are shed and being lighter, are carried by the air-currents. It is a common sight to see these seeds coming in through doorways and windows, floating by, even in the still air.

The samaroid fruits of *Gyrocarpus jacquini* have a pair of long, stiff wings, turned in opposite angles like the blades of a propellor or shuttle-cock. These wings offer resistance to the air, and the fruit drifts afar before alighting on the ground as if it were a helicopter.

The fruits of *Cardiospermum halicacabum*, *Combretum ovalifolium*, *Dodonaea viscosa*, *Terminalia arjuna*, etc., have a globoidal body with lateral lobes in a vertical plane. They are also carried about by wind.

Martynia annua, *Xanthium strumarium*, *Triumfetta rotundifolia*, etc., are plants which depend on animals for their dispersal. These fruits develop pointed hooks or bristles for clinging on to the skin of the animals which after going some distance and finding them a persistent "thorn on their side," manage to get rid of them.

All these and more specimens relating to the Morphology of plants, are exhibited in the vertical show-case.

FREAKS

Alongside these exhibits, a few freaks of nature have also been put on show. Though they do not carry much of any scientific importance, their inclusion has been deliberately arranged for in the hope that they would help the Institution attract the general masses so that its educational services could be fully utilised. Some of these exhibits are double-chambered coconuts, quintuplets of brinjals, and much-branched and fused aerial roots.

CEREALS

Cereals are the grasses which are cultivated for their edible grains. They are of primary importance for human sustenance. They chiefly contain starch, besides proteins and vitamins. The outstanding cereals of temperate regions are wheat, barley, oats and rye. In the tropical regions, rice and millet form the staple food of the millions.

A separate importance is accorded to the cereals in the gallery. Ear-heads of improved strains of cereals are displayed in a wall-case. A brief mention is made of them below.

The Rice (*Oryza sativa*) is the most important cereal in South India. It is an annual grass grown in vast quantities chiefly in wet lands. The rice contains less fat and protein than the other cereals do, but it is rich in small starch-grains which are easily digested.

The Indian Millet (*Sorghum vulgare*) is the most extensively grown grain in the Old World. The other millets are *Panicum crus-galli* and Ragi (*Eleusine coracana*).

Besides these, a few improved seeds of cereals are also exhibited in a row in a vertical case near the wall. They include the seeds of a few improved strains of the Paddy (CO 2, CO 6, CO 7, CO 8, and CO 11), which are the products of research-work carried on at Coimbatore. Seeds of the Wheat (*Triticum aestivum*), coloured and

white varieties of the Indian Millet (*Sorghum vulgare*), and yellow and red varieties of Ragi (*Eleusine coracana*) are also on display.

The Wheat (*Triticum aestivum*) is the most important food in temperate climates. Save rice, it is the most largely used grain. Bread, cake, pastry, etc., are all made of the flour obtained from its grain.

Grains of the Ragi (*Eleusine coracana*) supply the food for the hard labourer.

OIL-SEEDS

The vegetable oils are of various kinds, eg., fatty, volatile, etc. They are useful in a number of ways such as making of paints and varnishes, lubricants and soaps, sweets and savouries, and in pharmacy and perfumery. They are extracted from the seeds of various plants generally, a few of which are exhibited in this gallery.

Seeds of the Castor-oil plant (*Ricinus communis*), when bruised and pressed, yield an oil useful for ever-so-many purposes. There is hardly a home in South India, which does not know the use of this oil as purgative. The oil is used also for illumination and lubrication.

Seeds of the Cotton tree (*Gossypium herbaceum*) have a clothing of one-celled, flattened, twisted, tubular hairs which form the cotton of commerce. The seed contains an oil which can be used as a substitute for the olive oil. The oil finds also extensive application in medicine.

Seeds of the Nim (*Azadirachta indica*) yield a medicinal oil. The Nim oil is recommended in the treatment of skin diseases, leprosy and rheumatism. It is also believed to be antiseptic.

Seeds of the Pungam (*Pongamia glabra*) give a reddish oil which burns well and which has also got medicinal properties. It is painted as an ointment in the case of skin diseases.

A thick oil expressed from the kernels of the Indian Butter Tree (*Madhuca longifolia*) is yellowish in colour and is used in making soaps and candles.

Fruits of the Ground-nut Plant (*Arachis hypogaea*) are pods containing seeds from which the common ground-nut oil is extracted. This oil is used extensively in making the preparations for the table, and the seeds are in great demand on that score. The seeds themselves are edible. If taken in a moderate quantity once a day, they make a good dessert. Their nutrition value is high enough to consider them as the "poor man's almond." On the medicinal side, the oil is an astringent, aperient and emollient. It can also be used as a substitute for the Nim oil.

The Linseed is obtained from the Flax Plant (*Linum usitatissimum*). It is oval and compressed in shape, and brown in colour. A valuable drying oil is expressed from it. This oil is used for multifarious purposes, the chief of them being paints, varnish, linoleum, soap and printer's ink. It is also a "First Aid" material. It is mixed with limewater and applied to burns.

Seeds of the American Poppy (*Argemone mexicana*) which has now become naturalised in India, are laxative, emetic, expectorant and demulcent. They are used also as an antidote to snake-poison. An oil expressed from them is a purgative, but mainly used in treatment of skin diseases.

Seeds of the Mustard Plant (*Brassica juncea*) are only too well known. They are used extensively in South Indian homes for the preparations for the table. In the North the oil extracted from them is used for the toilet.

The Gingelly oil is one of the most commonly-used vegetable oils in South India. All important and many day-to-day preparations for the table, are made in it, if not in pure ghee. Its usefulness extends into medicinal preparations, also. It is expressed from the seeds of the Gingelly plant (*Sesamum indicum*).

All these and more specimens of oil-seeds can be seen in the vertical show-case with desk.

TEA-CULTURE

Important stages in the culture and cultivation of the Tea Plant (*Camellia sinensis*), are illustrated in six attractively coloured pictures hung on the wall. Selection of seeds for growing the plants is illustrated in one chart. A view of the work in the nursery where the young plants are raised is depicted in another chart. The third chart shows spraying of pesticides on tea-gardens so as to ensure healthy and vigorous growth of the plants. The next two charts show the way the tea-leaves are picked and carried to the factory where-in they are fermented, processed and packed for auction. The last chart depicts the outward movement of the packed tea-leaves from the factory.

TIMBERS

Wood suitable for building and carpentry purposes, and the trees yielding such wood are generally referred to as timber. Almost every other material used by us, contains timber in some form or other. Timbers are divided into hard and soft woods, and sorted out after felling according to their grain and texture. The timber is seasoned in sheds for arresting what is known as the "movement in timber," which may be expansion or contraction in size owing to the influence of

moist or arid conditions in the atmosphere. A seasoned wood is stable and does not show any such movement beyond a negligible extent. Timbers, being organic materials, are subject to rot and decay. To protect them against this, they are coated with a preservative, such as creosote.

Specimens of important timbers are exhibited in two groups. One group consists of those timbers that are used in India for making agricultural implements (please see further down) and machinery. These specimens are dressed as small slats and neatly mounted on a large board which provides also a black background.

The Bael (*Aegle marmelos*) is a small tree with strong and straight spines, and sheds its leaves seasonally. It is sacred to the Hindus, as its leaves are said to be a favourite of Siva's. The wood of this tree is quite hard and of a yellowish white colour.

The Jack (*Artocarpus heterophyllus*) is a large evergreen tree with dark green leaves. The timber, obtained from it and known as Jack-wood, is also suitable for making furniture. Its original colour is yellow which later on, becomes as dark as Mahagony. This wood takes a fine polish. A yellow dye can also be obtained from it.

The Teak (*Tectona grandis*) is a big tree with a handsome appearance when in flowers. It sheds its leaves in the dry season. The wood is very heavy, strong and durable. It resists attacks from white-ants. It contains an oil which prevents nails from rusting. Though expensive, it is widely used in house-building and ship-building industries, and also in making such articles of furniture as those for which the cost should not matter in the interests of durability. It is also used in making agricultural tools and implements.

The wood of the tree, known as *Wrightia tinctoria*, is white and suitable for turning on the lathe. It is a common deciduous tree, both wild and cultivated.

The second group of exhibits of timber consists of specimens of logs of general importance. A few of them are referred to below.

The Indian Badam (*Terminalia catappa*) is a deciduous tree, attaining sometimes a height of about 80 feet. It yields a red wood which is quite hard.

The Jujube (*Zizyphus jujuba*) is a small attractive tree. It is easily identified by the three long veins on the leaf and by the peculiarly shaped twigs. It grows in dry regions. The wood is very good for building purposes and also for fuel. The branches are used in erecting fences.

The Mango (*Mangifera indica*) is a widely known, big, shade-giving tree. It is valued for its fruits. The timber is not very hard and durable. It is only used for making planks, and for packing cases.

The Tamarind (*Tamarindus indica*) is a large beautiful tree, with short and strong trunk. The wood is very hard and strong and hence it is used in making wheels, mallets, furniture, etc. It is also a good fuel.

The Guava (*Psidium guajava*) is a small tree with a smooth trunk. Though an exotic plant, it occurs extensively under cultivation and has become naturalised. It yields a greyish brown wood.

The plant known as *Hemicyclia sepiaria*, is a small evergreen tree with rigid branches. It can be seen generally in the scrub-jungles. The wood is white with brownish heartwood. It is close-grained and very hard.

The Nim (*Azadirachta indica*) is a large evergreen tree with handsome appearance and straight trunk. Practically all the parts of the tree are useful. The timber looks like mahogany. It is very hard and heavy. The wood is not affected by insects because of its bitter taste.

Java Plum (*Syzygium cumini*) is a tall handsome evergreen tree. Its timber gives a good fuel.

FIBRES

The Pudukkottai area is rich in fibre wealth, especially in those vegetable fibres which are required for cordage. Fibres needed for making ropes, twine, etc., are adequately represented in the room housing the Art and Industries Section. Fibres of the Deccan Hemp (*Hibiscus cannabinus*) are fine and silk-like, and used for making fine ropes and sacks. They are also exhibited along with a few other fibres like those of the Milk Weed (*Calotropis gigantea*), the Sunn Hemp (*Crotolaria juncea*), the Aloe (*Sansevieria zeylanica*), etc. The people of the area, however, make use only of the coir (*Cocos nucifera*) for cordage, which is also exhibited. A sheet of the bark of the Upas tree (*Antiaris toxicaria*) of the Western Ghats, is worthy of mention. The Rishis of yore used only such barks as this, perhaps, for their loin-cloth! Even today some people on the Ghats are reported to be using it as a ground-sheet. It can be chiefly used as a raw-material for manufacture of paper.

FERTILIZERS

As the plants grow on the soil, they absorb and utilise the nutrient salts in the soil, for their life-activities. The result is a gradual

diminution in the degree of fertility of the soil, which would ultimately lead to barrenness. Consequently the plants growing on such a soil would start showing "deficiency diseases" and ultimately perish. If however this law of Nature should not be allowed to have its course, the only way open is to restore the lost materials in the soil. Nature herself provides for such restoration through accumulation, decay and dissipation of the dead and rotting organic materials. This is carried on in Nature as a never-ending process, but only at a slow pace. When the process has to be quickened, the needed materials, either as dead or decaying organic matter or as processed chemicals, are brought and mixed up with the soil.

The time-honoured material that is used to fertilize the soil, is the farmyard manure. It contains all the essentials required by the plants. It is generally collected and sold as the municipal compost, by the local authorities of a township. A few other organic manures are bone-meal, blood-meal, horn-meal, fish-guano and other organic refuse which are all valuable as fertilizers.

Roots of the plants of the family, Leguminosae, are important as supplying nitrogenous salts to the soil. These plants are generally raised as rotation crops, alternating with the others. They are generally small plants and are ploughed into the soil straightway before transplanting the main crop in the field.

Leaves of a large number of plants are also similarly ploughed in for improving the fertility of the soil. Some of them are the Daincha (*Sesbania bispinosa*), the Sunn-hemp (*Crotalaria juncea*), etc. They are all referred to as green manures generally.

In order to supplement these organic manures, inorganic substances are also used. Some of them are Sodium nitrate, Ammonium sulphate, basic slag, superphosphate, etc.

Samples of all these exhibits are displayed in glass containers in a wall-case in the Economic Products gallery.

AGRICULTURAL EQUIPMENTS

This gallery contains, besides the other exhibits mentioned in the foregoing paragraphs, equipments used by the agriculturists. There are, thus, large and actual specimens of a *mhote*, mould-board plough, wooden plough and a set of miniature models.

The *mhote* is made of the slats taken from the stem of the Palmyra Palm (*Borassus flabellifer*). It is hemispherical in shape, and used for baling out water from a well or pond.



Fig. 12. A COLLECTION OF MODELS OF AGRICULTURAL IMPLEMENTS.

A mould-board is a board in plough, which is used for turning over the furrow-slice. The implement, as can be seen in the exhibit, is of iron.

An exhibit of the common plough is readily recognized in the gallery. It is the principal and the most common form used in many of our villages, for turning the soil.

A number of miniature models of agricultural implements and water-lifts that are generally employed by the agriculturist in his profession, are displayed in a large centrally-placed show-case. A closer examination shows that these exhibits are all completely self-explanatory. The models include besides ploughs and *mholes* and other water-lifts, those implements that are used during and after a harvest, such as sickle, winnow, *marakkal*, double-bullock cart, oil-press, grinders and mortar and pestle.

A large bromide colour chart illustrates the equipment used for spraying pesticides.

FUNGAL DISEASES OF PLANTS

In glass-topped boxes arranged along the wall, are herbarium collections showing the different types of diseases caused by fungi in plants. The fungi are the lowest division of cellular plants. They have no chlorophyll and cannot therefore prepare starch. Their bodies are known as mycelium and consist of a much branched mass of microscopic filaments. The fungi obtain their nutrition from organic matter, dead or alive. When they settle on living organisms, the latter get greatly handicapped or damaged, or even killed. Plants, thus affected, are said to suffer from fungal diseases.

A number of herbarium specimens which show the effects of the fungal diseases in plants are displayed. A few of these specimens are referred to below.

A specimen of *Sorghum vulgare* shows what is known as the "leaf-shredding" disease. In the specimen the leaves are seen cut up into fine shreds. The disease is caused by *Sclerospora graminicola*, a fungus.

The "Rust" is a common disease met with in many of the important grasses, like *Pennisetum glaucum*, *Sorghum vulgare*, &c. This disease is produced by different fungi on different plants, as the exhibits show. *Puccinea penniseti* and *P. purpurea* are the fungi which produce the rust respectively on these plants. The fungi spread inside the leaves, restrict the leaf-growth and affect the photosynthesis. These diseases manifest themselves in the form of dark spots on the leaves.

The term "green ear" sounds rather interesting but it is not quite so to the plants. For it is a disease caused by the fungus, *Sclerospora graminicola*. This fungus brings about sterility in plants as in the exhibit of *Pennisetum glaucum*, the ears of which bear no grains.

The "blast" is another disease produced by the fungi, such as *Piricularia oryzae*. Besides others, a specimen of the Paddy (*Oryza sativa*) attacked by this fungus, shows the amount of damage suffered. The leaves have brown patches and the ears have few grains.

Another important illustration in the gallery is the "leaf-spot" disease of plants. The disease is produced by the fungi *Ramularia* sp., *Cercospora sorghi*, *Colletotrichum curcumae*, etc. Specimens in the gallery, showing the diseases caused by these fungi respectively are the leaves of *Gossypium herbaceum*, *Sorghum vulgare* and *Curcuma longa*. The disease appears in the form of spots on the leaves, and retards photosynthesis. In the exhibit of *Sorghum vulgare*, the leaves are heavily spotted; in *Curcuma longa* they have developed large grey patches; and in *Gossypium herbaceum*, they are both spotted and stunted.

Rhizoctonia bataticola causes the "wilt" disease in *Gossypium herbaceum*. The stem of the plant withers away owing to this disease. A small bit of a stem of *Gossypium herbaceum* attacked by the wilt disease is on display.

The disease known as the "budrot" occurs in the palms. It is caused by the fungus, *Phytophthora palmivora*, which attacks the terminal buds of these plants. Specimens of diseased leaves of these plants, with brown patches and a hole, are exhibited. Destruction of the terminal buds virtually destroys these plants.

There are also exhibits illustrating the disease, known as the "red rot," which is very commonly seen in the Sugarcane culms (*Saccharum officinarum*). The disease causes red colours on the culms and renders the cane-juice bitter. The culms of the sugarcane attacked by this disease, are exhibited as spirit-preserved specimens. A detailed illustration of the same is also provided in attractive wall-chart.

The fungus, *Fusarium moniliforme*, causes the disease called "foot rot." It affects the conductive tissues in roots and stems, with the result that those essential parts rot away and the plant dies. Diseased and reduced roots of the paddy (*Oryza sativa*) are on display.

The Paddy Grass, when it is attacked by the fungus, *Ustilaginoidea virens*, at the ripening time, becomes sterile. This fungal disease is

called the "false smut." In the exhibit on display the ears have sparingly few grains.

A diseased specimen of *Sorghum vulgare* on exhibition, shows the effects of the disease, called the "Whole-head Smut." *Sorosporium railianum* is the fungus which is responsible for this disease. Under its attack, the crop is replaced by a black sooty powder.

A diseased leaf of the Groundnut Plant (*Arachis hypogaea*) shows what is called the "ticca disease." *Cercospora personata* causes this disease which appears as brown spots on leaves.

In addition to these herbarium exhibits, there are eight bromide-enlarged charts in colour, which illustrate the effect of some of these diseases on living plants. The most notable among them is the "stem bleeding" disease of the Coconut Palm. In this case the treatment for the disease is also indicated. The stem-bleeding disease affects generally the Coconut Palms (*Cocos nucifera*). It causes small or big wounds on the stem, through which the sap bleeds out. As a result, the tree starves and stops growing.

The "Campaign Calendar of Fungus Diseases of Economic Crops" of the Government of Madras is also displayed on the wall. It is a very highly educative chart and details a number of diseases with suggestions for the steps to be taken for their eradication season-war. The chart covers a number of diseases to be treated district-war.

PART III

HUMANITIES

Pictures and Paintings Section

The Pictures and Paintings gallery consists of pictures, paintings, murals and frescoes, and is arranged at present at four different places : the oblong hall at the entrance, the narrow corridor leading from the Mammal gallery to the garden, and the apartments housing the Art and Industries Section and the Anthropology Section.

PICTURES AND PAINTINGS

Pictures and paintings occupy almost all the available wall-space in the oblong entrance hall. The exhibits comprise of paintings and their reproductions, portraits (including photographs) of the rulers of former Pudukkottai State, portraits of their friends, and photographs of the International Museums Week Celebrations of 1956, in which this Museum participated.

The paintings (including reproductions) occupy a third of the wall-space. They illustrate Tanjore, Jaipur, Deccani and modern schools of painting. "Tanjore Raja" and "Raja and Rani" are a few of the typical representations of Tanjore Paintings. The group of Jaipur paintings contains two note-worthy paintings on mica. They are "Lakshmi" and "Kalki Avathar." Among modern paintings special mention may be made of "Visvamisra and Menaka" in oils (by Veerarayan Raja), "Head of a Man" in oils (by R. Vasudeva Rao), and "Beggar Maid" in water-colour on silk.

The portraits of the Tondaiman rulers of Pudukkottai are hung on the walls at the entrance to the Zoology galleries. With them is also exhibited the coat - of - arms of the Tondaimans, in which the words, "Shri Brihadamba Sahayam - Pudukota Samasthanamu," are inscribed in Telugu. There are also two interesting exhibits which are connected with their rule. One is a letter to the Pudukkottai Durbar, signed by Gandhiji, and the other an address of welcome to him by the "Public of Pudukkottai (State)." Gandhiji's letter is dated 19—9—1921, and the address of welcome 21—9—1927. Gandhiji's letter is in reply to a request from the Durbar, and contains a promise to change his route and avoid entering the Pudukkottai State.

The friends and helpers of the rulers of the old Pudukkottai State, whose portraits stand arrayed in the gallery, include British monarchs and the reputed administrators of Pudukkottai. The chief among the



Fig. 13. COAT-OF-ARMS OF THE TONDAIMAN RULERS OF PUDUKKOTTAI.

latter are Sir A. Sashia Sastriar, Rajakumar Vijaya Raghunatha Durairaja, Sir G. T. H. Bracken and Sir Alexander Tottenham. Sir Alexander's personal interest in the development of the Museum cannot be over-adequately described.

MURALS

In the corridor that leads from the Mammal gallery to the garden, are exhibited on the walls, forty collotype reproductions of the mural paintings of the Mattancheri palace and temples in Cochin, which date from the sixteenth to the eighteenth century A. D. The murals were initiated by Vira Kerala of Cochin and developed by his successors. Fortunately, they have been spared by the unskilled renovators and vandals down these centuries, and so retain their antique value in full. The figures are conventional and drawn from the *puranas*, a good number of them illustrating scenes from the Ramayana. In general effect, they rival Ajanta frescoes.

FRESCOES

In the apartment housing the Art and Industries gallery are exhibited pictures and paintings relating to the fescoes of Sittannaval, Ajanta, Sigiriya and Iran.

Sittannavasal Frescoes

At Sittannavasal, near Pudukkottai, is a rock-cut cave temple. The ceiling of the *garbhagraha* is painted with various Jaina symbols. The pillars and ceiling of the *mantapam* outside the central shrine, also show paintings. The paintings depict a lotus pool or tank, and form important specimens of Jaina art. The lotus tank contains a number of lotus flowers, buds and leaves, fish, geese, cranes, crocodile, bulls, elephants and three men (each with a lotus in his hand). Fish is an auspicious object for the Jainas, and the elephant, bull and lotus pool are important as the subject of Mahavira's mother's dreams before his birth. The lotus tank itself is held sacred by the Jainas. Because of all these factors taken together, the motif is distinctly Jain, although the lotuspool with birds standing in it is seen in the Buddhist sculptures of Amaravathi. The frescoes which were rather "discovered" in 1920 seem to be contemporary with some of the painting at Ajanta. Figures of king and queen portrayed in them bear close resemblance to the figures in the Adivaraha cave-temple of the period 600-625 A. D. at Mahabalipuram. The date of the frescoes is however a subject of controversy, and some experts ascribe a much later period to them, owing to their Jaina motif.

Ajanta Frescoes

The Ajanta frescoes range in date from the second to the seventh century A. D. The frescoes are believed to have been painted for the purposes of dissemination of the knowledge of Buddha. They are ranked among the great pictures of the world. They appear to be a combination of both *fresco buono* and *fresco secco*.

Copies of Ajanta frescoes are chiefly from Cave I. They contain illustrations of the then prevailing dances, decorations, Bodhisattvas and Jataka stories. The pictures speak of something in common with the frescoes of Sittannavasal.

Sigiriya Frescoes

Sigiriya or "Lion Rock" is a gigantic mass of granitic rock in Ceylon. Situated on top of it, are the ruins of the fortress of King Kassapa I of Ceylon. There is a natural cavern half-way up the rock, the walls of which are plastered, and painted over with beautiful frescoes. The frescoes are famous the world over, and belong to the period 479 - 497 A. D. They represent Kassapa's queens with attendants on their way to worship at a Buddhist monastery. They appear to have been derived from Ajanta, and being located in a not-easily-accessible place, are well preserved.

Iranian Frescoes

The Iranian frescoes date from 16th - 17th century A. D., and belong to the place, Isfahan, in Iran. They once adorned the walls of palaces of Ala Kapy and Chehel Satoon in that country. There remains now very little of the original frescoes. Mr. Sarkis Katchadourian made a careful study of these remains, and reconstructed the paintings. Two of these reconstructions are exhibited in the Museum. Both of them belong to the ruins of Ala Kapy. The Paintings have the linear qualities and brilliant (but gentle) colours which are generally characteristic of the Iranian frescoes of 16th to 17th century A. D. Beauty (both material and spiritual) of wine, women and nature, stands reflected in them with all the epicurian delight which is stressed in some of the Iranian verses, the chief of them being the Rubaiyat of Omar Khayyam.

Numismatics Section

Unlike other objects of every-day use, coins and medals have always been held in high esteem by their owners. The savings bank of olden days were containers (described elsewhere) which were kept hidden underground. They have now become important sources for collection of antiquities in almost every country, and throw much light on the wealth and importance of sites of ancient civilization. The quality of numismatic finds in any country speaks of the commercial and economic past of that country. Thus for example, finds of Roman coins in India go to show the amount of export trade which our country had in the past. Both coins and medals portray the characters and tastes of those who issued them, and give us some glimpses of ancient religion and mythology. The principal metals for making coins were generally electrum, gold, silver, copper, bronze and lead. The choice of the metal reflects the prosperity of the country in the particular period. The Kushans and most Indian dynasties, for instance, used gold coins till the twelfth, and again in the seventeenth century A. D., while the Andhras of ancient India have used even lead coins.

The Government Museum, Madras, the Bombay branch of the Royal Asiatic Society and other similar institutions of good reputation have enriched the Numismatics Section with many valuable coins.

This Section contains representative collections of Roman coins (found in the erstwhile Pudukkottai State) as well as Vijayanagar, Andhra and other South Indian coins such as those issued by the Moghuls, Bahmini Sultans, and the French, Dutch and English East India Companies.

The numismatic collections are not on exhibition, for reasons of security. They are kept in safe chambers, and will be produced for examination if any one specifically interested in them, applies to the Curator.

Art and Industries Section

Products of cottage industries carried on by women in and around Pudukkottai, that were mainly collected for the South Indian Exhibition of Women's Work in Madras, found their way to the Museum and formed the Art and Industries Section. This Section was opened in the years, 1919-1920. It exhibits specimens of almost all the industrial products from both within, and without, the Pudukkottai area.

The exhibits are, as can be expected, very varied in character. They can be brought under three heads : fine arts, industries and handicrafts. The exhibits under fine arts include illustrations of the important dances of India ; those under industries, are rather numerous and comprise raw materials and representative samples from seven different industries ; those under handicrafts are also of a varied nature, and may be conveniently split up into fancy objects and carvings.

DANCES OF INDIA

Seven types of dances of India are illustrated in the gallery, through the medium of pictures. They are Rajasthani dance, Manipuri dance, Muria dance, Santhal dance, Kathakali dance, Bharatha Natyam and Karagam dance. All the pictures, except the last mentioned, are in colour. The Karagam dance is a kind of folk dance commonly seen around Subrahmanya temples in South India. It is performed by the devotees as a part of their vow. It involves quick and jerky movements, balancing at the same time a large conical structure on top of the head without holding it by the hand. The conical structure is an object of bamboo-work, profusely decorated with flowers.

The Kathakali dance has its home in the Kerala State. It is a sort of dance-drama, generally tending to signify that the good will triumph over the evil. The dancers require great practice and an elaborate make-up, since the language used, consists more of gestures than of words. This dance is therefore somewhat allied to the Bharatha Natyam.

The Manipuri dancers are, by virtue of their more attractive make-up, formidable rivals to the Kathakali dancers, for popularity. The Murias and Santhals are tribals, and their dances can be best appreciated only when their social life is well understood. The Muria dance is more like a " kummi " which is a kind of group dance in which a number of women move round a circular ring, clapping the hands and placing the steps rhythmically to the strain of popular

folk songs. But the Murias produce a more pleasing note with metallic *thalams* in their hands. The Rajasthani dance is somewhat similar to the "kolattam," but for the absence of the sticks. The artists wear colourful costumes which produce a picturesque effect, and move round a circle with rhythmic gait and movement of limbs. The Bharatha Natyam has gained an international fame, and in this part of the Country, even three-year old toddlers try to practise it.

EARTHENWARES

Representative samples of the earthenware industry are also on exhibition. They are made of the potter's clay that comes from around Pudukkottai. They are strong and are in great demand.

METAL WARES

Products of the metal-ware industry are more attractive than the earthenwares, because of their glittering surfaces and attractive finishes. The exhibits can be grouped under brass wares and bell-metal wares. Despite the availability of cheaper substitutes in iron, clay, China and aluminium wares, the brass-ware industry has kept up its head high on account of the system of performing marriages with dowry. Brass sheets are obtained from Madras, and the utensils alone are made in the neighbourhood of Pudukkottai. Among the brass-ware exhibits, a small brass basket with four out-curved legs, requires special mention.

Though fine and excellent articles of bell-metal are manufactured in the Pudukkottai area, the industry has not assumed such proportions as to compete with its kind at Madurai and other nearby places. A large bowl with its rim beautifully and attractively cut into floristic designs, and a pumpkin-like receptacle with a hinged lid at the top are much admirable in the collections. Even more attractive than these utensils, are the numerous, small objects, a majority of them representing the various members of the animal kingdom including scorpions and spiders.

TEXTILES

A large part of the available space in the hall is devoted to the textile industry. The industry covers all its three major divisions : cotton, wool and silk.

Cotton

The exhibits of cotton textiles are arranged in three long showcases. Cotton cloth is woven both within and around Pudukkottai.

The yarn is not coloured ; it is obtained from Kumbakonam and other places. The cloth is coloured locally ; Thiruvapur within the Pudukkottai Municipality, earned at one time the maximum reputation for it. At present however, the industry is not prosperous. The dyeing process is similar to what obtains in the rest of the Madras State. The dyes used are both aniline and vegetable. Some of the chief vegetable dyes are the Indian Madder (*Rubia cordifolia*), the Turmeric (*Curcuma longa*), the Bastard Saffron (*Carthamus tinctorius*), the Indigo (*Indigofera tinctoria*), the Chay root (*Oldenlandia umbellata*), etc. Some of these principal dyes, a few wooden blocks used for printing the designs, and some finished products like bed-cover, curtain cloth and sarees which are rare specimens of our art and industry, are displayed in the collections. Prominently exhibited in a huge show-case is a *charka* (or spinning wheel) which is used for spinning cotton yarns generally on a cottage industry scale. The *charka* in India has gained a political importance under Gandhiji's zealous patronage.

Wool

The wool industry of Sellukudi, a place near Pudukkottai, is well represented. It consists only of spinning wool and weaving cumblies. It has however not developed beyond the primitive methods, on account of the low quality wool that is yielded by the local breed of sheep. The exhibits in the gallery illustrate all the important stages in the industry, commencing from the shorn wool and ending with a finished blanket. Important implements used in the processing of wool, are also shown.

Silk

The silk industry is represented by a few silk dhotis and silk yarns. There are a number of dyes in use for colouring silk, but the favourite ones are red and yellow. The red dye is obtained from stick lac, and the yellow from a mixture of lime, Fuller's earth, gingelly oil (*Sesamum indicum*) and Kamella powder (*Mallotus philippinensis*). The exhibits include also materials stained with aniline dyes. A couple of skeins of Tussor silk yarn, presented by the Tata's Silk Farm at Bangalore in 1909 and exhibited in the Museum, still retain their feel and lustre undiminished.

Embroidery

Embroidery work is carried on as a cottage industry in Pudukkottai. The cloth (silk, etc.) is kept stretched in circular frame, and gilt braid, tinsel discs and metallic tubes are stitched on to the cloth in decorative designs. In the Museum a separate representation is given to the products of lace and embroidery work.

MATS

Representatives of the mat industry are a *korai* mat, a couple of *khas-khas* curtains and fine-grass silk mats of Pattamadai. The *korai* mat is a product of cottage industry at Pudukkottai. It is used by the people of all classes, high and low. Only the thread for the warp is obtained from within the Pudukkottai area. It is extracted from the American Aloe (*Agave americana*). The chief raw material which is the triangular culm of the sedge, *Cyperus rotundus*, is obtained from Thiruchirappalli and Tanjore. The *khas-khas* curtains are prepared of the roots of the *khas-khas* grass (*Vetiveria zizainoides*). These roots are aromatic and retain their aroma for a very long time. Kept moistened a little with water and against the in-flow of the hot breeze in summer, the curtain provides an artificially-cooled and fragrant atmosphere in the rooms. The same curtain may be used for a number of seasons, if properly employed and stored. The exhibits of Pattamadai mats come from a place called by the same name in the Tirunelveli District of the Madras State. They are woven of finely-split culms of the sedge, known as *Cyperus corymbosus*. They are called fine-grass silk mats and they have become the pride of South India in recent years. They can be rolled up and bent so as to make both ends meet without breaking, for carrying in a suit-case.

BANGLES

The bangle industry of the Pudukkottai area is also represented. The exhibits consist of glass bangles, lac bangles, their raw-materials and the implements used. Till recently the glass-bangle industry was flourishing well. But it has now gone into decline for want of fire-wood. The lac bangles are rather bye-products of the cloth-dyeing industry. The lac refuse obtained after dyeing the cloth with lac, is utilised as a raw material for making bangles. The final product is merely dyed or both dyed and gilded, in order to render it fanciful. All these materials are attractively displayed in the gallery.

TOYS

Exhibits of the toy-making industry, lie distributed at several places in the hall, making isolated groups by themselves. They are all made of wood, or of wood and plaster of Paris. Even the common toys like the chess-men, small toy utensils, etc., are exhibited. They include a fishing boat in which every detail is reproduced. A group of toys under the caption, Dasavathars, from Panruti, South Arcot District, is shown in a separate show-case. Besides Vishnu's own Dasavathars they include also Bali and Balarama. There are toy-like models prepared by Sri Venkatarangam Raju, a former Curator of the Museum

and exhibited as a separate group. Of these toys, the series giving the details of dress, etc., of people of different avocations, is very interesting. Lacquered toys from Mysore form another attractive series and merge with the next group, the handicrafts.

HANDICRAFTS

The exhibits of handicrafts speak eloquently of the dexterity of their makers. A chariot, made of paddy grains, small sticks and glass beads, very closely represents on a mainiature scale, the temple cars in South India. A product of great skill, is the model of vegetable garden. The vegetable concerned is the Snake Gourd. The model was made by V. Maruthamuthu Ammal of H. H. the Maharaja's Girls' School, Pudukkottai. Carvings on different materials are also exhibited. There are carvings in ivory and horn. The ivories are from Travancore and the workmanship displayed in them needs no



Fig. 14. PITH-MODEL OF ROCK FORT, THIRUCHIRAPALLI.

special emphasis. Such topics as Dasavatharams, Gajalakshmi, Siva and Parvathi on bull, Kalinga Nardhanam, etc., are depicted. Many of the horns are from Pudukkottai itself, and depict the common crane, the prowling tiger, and the monitor lizard. An outstanding exhibit under handicrafts, is the pith-work of Thanjavur. Four different topics are illustrated by this single exhibit and they are the Rock-fort of Tiruchirappalli, Venugopala, Nataraja and Ganesha (standing). This pith-work cannot be too adequately described. The artist has taken all pains to include all possible details. Carvings on soapstone or steatite by the Pudukkottai craftsmen are admirable. The figures represent Hindu deities. A beautiful marble statue of Buddha from Bangalore is very prominently displayed. Another exhibit for

admiration, is a group of three wooden chains, each wrought from a single block of wood, the links being devoid of any joint. The Travancore coconut shell-work series consists of articles of fancy. It includes receptacles made of coconut shell and toys like tortoise, elephant, etc. The carvings on the shells are too intricate and beautiful to be achieved by ordinary hands.

Other products of handicrafts exhibited in the same hall, include sandalwood carvings from Mysore and mixed collections of sandalwood and teak-wood carvings. A folding fan with a swan on the handle, carved of sandalwood, is very prominently displayed. Carvings of Nandi in teak-wood, of Saraswathi in sandalwood, and of a buffalo in rose-wood, are a few specialities in the collections. Of them, Nandi is from Madras and Saraswathi is from Pudukkottai. Beautiful products of the wood-carving industry, that once adorned



Fig. 15. ANJANEYA, A PIECE OF WOOD-CARVING FROM PUDUKKOTTAI.

the Kalyanamantapam of the old Palace at Pudukkottai are attractively arranged and exhibited as a conspicuous and separate series in verandah behind the hall of Art and Industries galleries. They consist of floral designs interspersed with human and animal forms. They belong to the 18th century A. D., and include a pillar bracket, nine lintel brackets, six ceiling plaques and a cornice-festoon with frieze. Besides these, there are also a few specimens of wood-carvings from Kudumiyamalai chariot, which are dated to 17th to 18th century A. D.

Anthropology Section

Exhibits of the Anthropology Section form three, if not five, galleries, viz., the Arms and Armour gallery (with an extension at the verandah at the exit), Ethnology gallery (with an extension into the room housing the Art and Industries gallery), and Pre-history gallery.

ARMS AND ARMOUR

Arms and Armour gallery exhibits some of the equipments and weapons, used by the warriors of the past and armed forces of the present. The exhibits can be artificially classified into seven broad groups : physical culture set, military locks, weapons of manual strength and skill, armour, projectiles, fire-arms, and fighting vehicles.

Physical Culture Set

A group of exhibits used in physical culture, by the warriors of the by-gone days, is astounding. They include stone-balls, Indian clubs and a stone dumb-bell. The first two are generally used in Indian gymnasia even to this day, and are remarkable for their weight. The stone dumb-bell is however less commonly met with, if it has not already become a rarity. It is made of a gneissose rock, probably granitoid, and is of the shape of a " pixy " ring without its sharp edges, though several times bigger. The outer diameter measures about 18 ins. and the thickness about 9 ins. At the centre is a diametrically - placed cylindrical grip. It is too heavy to be lifted by any person other than a weight-lifting champion.

Military Locks

A small group of exhibits illustrate iron locks of the letter-lock pattern and their parts. They were used by the armed forces of Tirumayam in 1687 A. D.

Weapons of Manual Strength and Skill

Weapons which need both strength and skill for their efficient use, may be brought under (a) beating weapons, (b) thrusting weapons *without* hilt, and (c) thrusting or cutting weapons *with* hilt. The exhibits belonging to the first category are a stick, a wooden club and a steel mace. The first is a beautiful walking stick made from the stem of *Acacia sundra*. The wooden club is wielded by the hand, and is heavy

enough to break the opponent's bones. The steel mace is also a similar weapon, but it has a knuckle-guard and sharp-edged steel flaps at the distal end. A blow from it will not only crack the bones but also cut the flesh.

The thrusting weapons *without* hilt consist chiefly of the spears, goads and *magudu* in the gallery. There is a collection of twenty-two glittering spears arranged against a blue background at the far end of the gallery. All of them belong to the 17th and 18th centuries A. D. The blades of these spears are of different shapes and finely and artistically worked. Two of them are curved and they are used for hunting wild-boars. Five of the spears have got bolt-like lateral projections, one on each side below the blades. The blade of one of the spears is somewhat winged.

Goads are sharp-pointed instruments used for controlling and driving beasts. In the collections there is an ordinary elephant goad. It appears to be more attractive than harmful, although it has two blades, one straight and the other curved to a side. Its handle is beautifully decorated with glass.

With these weapons may be clubbed somewhat, the *magudu*. It is made of two horns of antelope (*Antelope cervicapra*) mounted together side by side, and their points turned in opposite directions. Small leaf-shaped spear-points are sometimes screwed on to the pointed ends of the horns. The weapon on display is beautifully inlaid with ivory and neatly polished. The length of these weapons is only half of that of the goad. There are two pairs of *magudus* on display.

The thrusting or cutting weapons *with* hilt, are the swords and their like. The weapon consists of a steel blade and a hilt with or without knuckle-guard. Twenty-eight swords of different sizes and shapes occupy a large part of the gallery. They belong to 18th century A. D. The longest of them is exhibited along with gauntlets (or steel gloves) that are used while wielding them. There is also a sword-cane which consists of a sword with a wooden handle, and which is carried hidden completely in a walking stick.

There are two rapiers which are long, narrow swords, used only as thrusting weapons. A pair of *surul kathis* (or coiled swords) are quite interesting. The blades of these weapons are kept coiled like a watch-spring.

A number of daggers which are but short, sharp, pointed swords, are also included in the exhibits. Daggers with straight blades are referred to as *jametads*, and those with curved blades, as *bichvas*. The collection of these weapons which belong to the 18th century A.D. form a conspicuous series, by themselves. They are displayed in three

wall cases to the right as one enters the gallery from the verandah of wood carving exhibits. Some of the Bangalore *jametads* among them, have inscriptions in Telugu. There are also three *bichvas* with bone-handles, and one with an ivory handle. There are also two Ghurka knives with cases, one *jametad*-like and the other *bichva*-like. Both of them have broad, sharp blades, and are displayed in wall cases on a pillar.

Bayonets are dagger-like weapons that can be fixed by their handles to muskets. A small collection of them presented by the Ordnance Depot Allahabad, includes also a Japanese bayonet and an Italian bayonet.

The chief cutting weapons *with* hilt are the battle-axe and the *pharang*. The battle-axe has a crescent-shaped blade which can be fitted on to any handle. The *pharang* has a broad scythe-shaped blade and a hilt with a knuckle-guard. It is used for controlling rogue elephants. Both these weapons are exhibited in the same show-case which contains the goad.

Armour

All arms and equipments that can be used only in self-defence or self-protection are referred to under the title, armour. The use of most of them now stand obviated on account of the development of powerful missiles. They were however inevitable for the individual's safety, in the days when fencing (or sword-fighting) cast the dice for victory.

A pair of iron gloves, known as gauntlets, are exhibited alongside the swords with which they are generally used. The gauntlets shown are made of steel and contain koft work of floral patterns demascened in silver.

At the far end of the gallery there are two wooden manikins clothed in mail armour, each wielding a wooden sword in one hand and a wooden dagger in the other. The armour protects them from crown to ankle, and gives a picture of the swordsmen of the by-gone centuries. A leather shield used by some of these gallants is also exhibited but separately along with rapiers, etc. It has four brass bosses, and is surmounted by a steel crescent.

The helmets present an interesting range of exhibits. There are chain helmets and steel helmets. Among the latter a Javanese helmet throws much light on the days of gallantry. It is attractively displayed under a separate glass cover. It has brass decorations which consist of lions' heads and creepers on the sides. On the front part is the crest or emblem of the warrior. The top or crown of the helmet has a plume

which gives a resemblance to a Greek helmet. The plume is also decorated with floral designs in brass. From the top edge of this plume hangs a rose-coloured fez. On the whole the helmet appears to belong to a warring monarch who does not enter into the thick of the fray, but only puts on a grand show to inspire confidence in his men. Other helmets of note, are the funnel-shaped Chinese helmets, the German helmets of 1914-18 A.D., and the East India Company helmet of the 17th Century A.D. The last-mentioned helmet is of additional interest in having steel flaps at the front and sides, which provide for additional protection.

A gas-mask which is still used as a personal armour, is exhibited in a separate wall-case.

Projectiles

A projectile is an object that is impelled forward with great force for striking at a distant enemy. The exhibits relating to projectiles in the gallery, can be split up into (a) missiles which are driven forward by manual force, (b) missiles which are driven forward by mechanical force, and (c) missiles which are discharged from firearms.

One of the missiles thrown by the hand is the stone-ball which is discharged with the help of a sling. The stone-sling is an instrument for throwing stones, and consists of a small, cup-shaped, closely-woven rope-net with two long ropes attached to it one on each side. The net and the ropes are prepared from the fibres of the Bow-string Hemp. The rope from one side of the net has a noose and that from the other side, a knot at the ends. The noose is held by the thumb and the end of the rope is firmly held by the hand. A spherical stone, is placed in the net and the sling is whirled round and round in the air with great force. A jerk is finally given and the stone darts straight towards the object, with a tremendous force and a whirring sound. Experts can hit the object with this stone from a distance of more than 100 yards. This instrument played a considerable part in the Poligar wars of the 18th century in killing or injuring the enemy. It was one of the chief weapons of the Kallars and Maravars in the past, but its use is now fast disappearing.

A little more effective than the stone from the sling, is the boomerang. The exhibits of boomerangs comprise the Indian types, used by the Kallars, Maravars and Valaiyars of the Thiruchirappalli, Madurai and Ramnad Districts even in the recent past. The specimens are from the armoury in the Old Palace of Pudukkottai. They are made of either hard-grained wood or iron. Some Megalithic burials have included boomerangs with the iron implements. Some of the sculptures of *dvarapalakas* and chieftains of the Pallava period show these

boomerangs fixed on the head. They are now-a-days little used, however. An Australian wooden boomerang (which is said to be still used by the aboriginals of that country) is also exhibited for purposes of comparison.

Iron boomerang was a national weapon of the Kallars and freely used by them in the war-fares of the past. This is also exhibited.

Korattu Kambu is a missile used by the Kallars, Maravars and Valaiyars in areas where the Indian Boomerang is used. It is a long, heavy, stick made of close-grained hard-wood, and slightly bent at one end. The curved portion of the stick has four pairs of iron rings which render the bent end heavier than the other part of the stick. It is used like a boomerang, when chasing the object.

Arrows are the common missiles which are driven forward by a mechanical force. Short spears or long darts can be successfully used as arrows if they are properly weighted at the striking end. The shaft may or may not be plumed. Bows are the contrivances which supply them the necessary driving force, mechanically. Arrows *as such* are not on exhibition in the gallery. But there are long and ordinary wooden bows, as well as a steel bow. The long wooden bow has decorations painted on it. The steel bow on exhibition is an addition from the Armoury of the Old Palace at Pudukkottai. Bows and arrows were the chief weapons of the soldiers in the premusketry days. The exhibits represent those that were in use in the 18th century A.D.

Missiles discharged with great force from firearms are the bullets, shells, cannon balls, etc. The bullets are explosive materials, conical or spherical in shape. They include cartridges and shot. The cartridge is a long, pointed structure of lead, with which the guns and rifles are generally loaded. They consist of a nose and a case. The case contains the chemical which explodes when the case is hit by the cock of the firearms. The explosion drives the nose forward at great speed, but the case is retained in the breech itself. Shot is a non-explosive spherical projectile, made of lead or of iron, which is driven forward by the force of an explosion which takes place outside it (shot), but inside the firearms. Small shot can be used even in air-guns in which neither combustion nor explosion takes place. Shells are explosive projectiles used in larger guns and cannons and carry the explosives. Bullets, including cartridges, lead shot and iron shot, are arranged in the oblong sloping case at the entrance to the gallery. The iron and lead shot were collected from the Thirumayam Fort in 1907.

There are iron, cylindrical shells and the moulds for making them, on exhibition. Each shell is filled with gun-powder, and has a hole at one end, which communicates with percussion fuse. These projectiles are very effective in breaching earth-works and masonry.

Cannon balls are also missiles which are driven forward with great force from cannons. If they contain any explosive charge they are used as shells, or else they are used in the same way as iron and lead shot. In either case the driving force is obtained from the explosion of a chemical inside a cannon. Eleven cannon balls are exhibited in the gallery, which are all made of iron. Of them, five are exploded ones. The exploded balls appear beaten out of shape and go to show the force and the impact with which the blow is dealt.

Pieces of flints are also displayed along with the guns in the oblong sloping case. They were used for producing the spark to ignite the priming in flint-guns.

Calipers are used for measuring the diameter of iron and lead bullets, so that no mistake is made in deciding their (bullets') suitability for the chosen gun. The exhibit of calipers in the Museum has come from the Tirumayam Fort which was a very important military station with well-equipped armoury in the 17th and 18th centuries.

Firearms

Firearms are those weapons within which explosions take place sending projectiles out with great force. There are several kinds of firearms the common among them being pistols, revolvers, guns, rifles and cannons. Pistol is a small firearm which is fired with only one hand. Revolver is a pistol with several chambers for cartridges. While any kind of firearm is called a gun, the term is applied generally to those firearms which call for the use of both hands. If its bore is rifled, then it is called a rifle. A cannon is also a gun but of a very big size, to fire which more than two hands are generally required.

The pistols and revolvers are arranged as an isolated group in a wall-case. Both muzzle-loading and flint-locking types of pistols are included. One of the flint-locking pistols has also a small bayonet fixed to it. Eleven different types of guns are arranged in an oblong sloping case. A double-barrel breach-loading gun used by a former ruler of Pudukkottai, while he was fourteen years old, in shooting an elephant in Travancore, is also included among the exhibits. It is remarkable that a boy of fourteen years was able to use such a sturdy gun. A gun which resembles a walking stick and goes therefore unsuspected, is also on display.

There are four match-locking guns with cock at the side of the barrel. The cock holds a match which causes the priming to ignite when the trigger is pulled. The priming communicates with the charge in the barrel through a small hole at the side, and causes it to explode. These guns were in use till the 17th century A. D.

The flint musket came into use in the 17th century A. D. In this the priming is ignited by a spark from a flint which strikes steel, when the trigger is pulled.

On a separate bench are exhibited a couple of machine guns, used in the Great War of 1914-18. They are mounted on their tripods.

A miniature model (rather realistic) of an Ack Ack gun that is used in shooting down air-craft, is exhibited in a show-case for modern war appliances.

There are ten cannons exhibited in the Museum, six of which are made of iron, and four of bronze. The bronze cannons have come into use from the 17th century onwards. One of the bronze cannons is a Dutch cannon of the 17th century A. D. ; it is exhibited inside the Arms and Armour gallery. All the other cannons are arranged in the verandah at the exit, forming there an extension as it were, of this gallery. Two of the iron cannons at the exit have come from the Pudukkottai Jail and the Thirugokarnam temple. The four remaining iron cannons are clustered together as a small and compact group at the exit. Of the three bronze cannons exhibited in the verandah at the exit, two have come from the Pudukkottai Palace, probably belonging to and used by the Tondaiman rulers. The other bronze cannon is called the Raghunatha Banam which has the following history : Towards the close of the 17th century, the King of Travancore took advantage of unsettled conditions, and stopped remitting his usual tributes to the rulers of Madurai. Mangammal, the Queen Regent of Madurai, then sent a large army in 1698 against him. One of the distinguished leaders of this victorious army was Raghunatha Raya Tondaiman who started the Tondaiman Dynasty of Pudukkottai. He conquered a number of places and returned with bronze guns as trophies of the war. One of them is this Raghunatha Banam, evidently named after the Tondaiman.

Fighting Vehicles

The term, fighting vehicle, is used in these pages only for conveniently referring to those vehicles which are used by the armed forces in the years, 1939-1945, in attacking the enemy. All the exhibits of this description are grouped together in one show-case which is marked off as "Modern War Appliances." They comprise miniature models (realistic in many minute details) of a tank, and bomber and fighter planes. The tank is an armoured car on caterpillar wheels. It is protected by guns which are mounted inside the vehicle itself. It is employed in an attack, for clearing trenches, destroying iron barbed wire fencings, etc. Bomber planes are heavy and designed

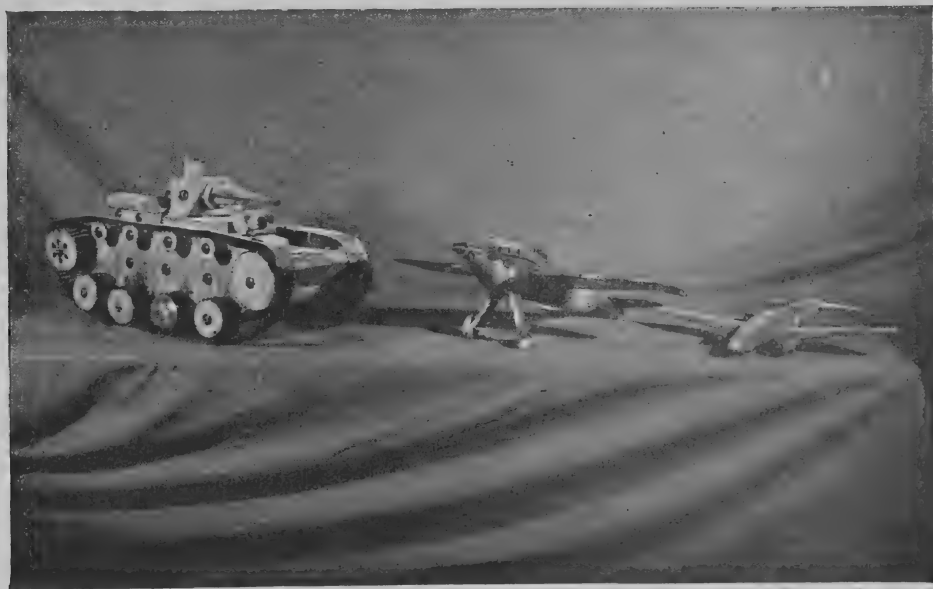


Fig. 17. MODELS OF ARMOURED VEHICLES.

to carry bombs for dropping on enemy positions. Fighter planes are lighter and designed to manoeuvre at high altitudes and to combat and ground other planes.

ETHNOLOGY

The ethnological exhibits consist of different kinds of jewels and ornaments, *thalis* and *bashingams*, rosaries and talismans, musical instruments, votive offerings, models of utensils used in animal sacrifices and a few pictures and paintings.

Musical Instruments

The musical instruments on display comprise the musical instruments proper and some pictures. The instruments, can be grouped under three broad classes: stringed instruments, wind instruments and percussion instruments. The stringed instruments include *veena* and *swaragath* (both seven-stringed), *sarangi* with bow and *tambura* (both four-stringed), *sitar* (six-stringed) *tuntina* and *ektar* (single stringed), the *villukko tu* of Travancore, and *moursing*. Almost all the commonly known and used wind instruments are exhibited. Some of them are the most popular *nathaswaram*, the *mukhaveenai*, the *magudu*, the S-shaped horn, the bellows, the dulcimer, the bugle, etc. They include also different types of flutes, eg, the concert flute, the shepherd's flute, and the flute made of a bone (human humerus). The Conch to which the Hindus attach religious importance, is also on exhibition. The collection of percussion instruments is also fairly comprehensive and includes four or five groups. The *kanjira*, the *tambattam*, the *baya*

and the *tabla* produce notes from a membrane on one side only. The *mridangam*, the *dolak* and the *tavil*, have membranes on both sides. The common pedlar's *kudukkuduppai*, *udukkai* and *davan'dai* are very similar to each other, but for small differences in shape and size. They are also double-faced with the percussion membrane on two sides. The "Triangle and Rod" is a musical instrument where-in the notes are produced by the beating of one metallic rod which is bent twice to form a triangle-like figure, with a straight metallic rod. The *chipla* and the *jakra* are also metallic type of percussion instruments. The *ghatam* is a round-bottomed earthen vessel, and the *kartals* are suitably-shaped flat, wooden pieces. In the former the notes are produced by drumming on the bottom of the pot-like vessel. By stroking one *kartal* against another in quick succession, musical notes are produced.

A peculiar exhibit along with the musical instruments on display, is the *thanthi panai*. This broadly resembles *ghatam*, but it is provided with a percussion membrane at the top and a string at the sides. It is thus a combination of percussion and stringed instruments in one.

Veena, *tambura*, *sarangi*, *mrithangam*, etc. were once manufactured within the Pudukkottai area, and brought good name to their makers. The industry has ceased to exist now, however.

There is a large oil-painting which depicts a group of three palace musicians who are Subbiah Bhagavathar (Vocal), Vaidyanatha Sastrigal (Drummer) and Gokarnesan (Sruti). The painting belongs to the modern schools in style and execution. There are also a number of photographs of other important musicians. All these pictures indicate the method of use of the more important instruments. This brief account of the musical instruments and pictures will not be complete without a mention of two photographs and one colour picture. The photographs are of two sculptures, one a Veenadhara Dakshinamurthi (of Nartamalai), and the other a Narada (of Tirumayam) playing on *yazh*. In the former, Dakshinamurthi is seen holding in the "reverse" way, a *veena* without sound box, and tuning it. The colour picture portrays the "Trinity" (or the three most important people) of Karnatic music, viz., Muthuswamy Dikshithar, Thiagaraja Swamigal and Sama Sastrigal.

Jewels and Ornaments

Different kinds of jewels and ornaments are exhibited in a six-sided show-case. In one side the general types of jewels and ornaments are displayed. They include, *rakkodis*, *Jadakuchchu*, ear-rings, ear and nose-drops, *kasais*, *koppus*, *jimikis*, *rudraksha malai* with golden bulbous pendant, waist-band, wristlets, rings and anklets. They are all gold-

gilded, and one of them, a bangle, is of silver. In the next side on the left, are displayed the ornaments worn by the Vallanadu Chettiar ladies. They consist of ear-screws, necklace, neck-band and also *thalis*. All

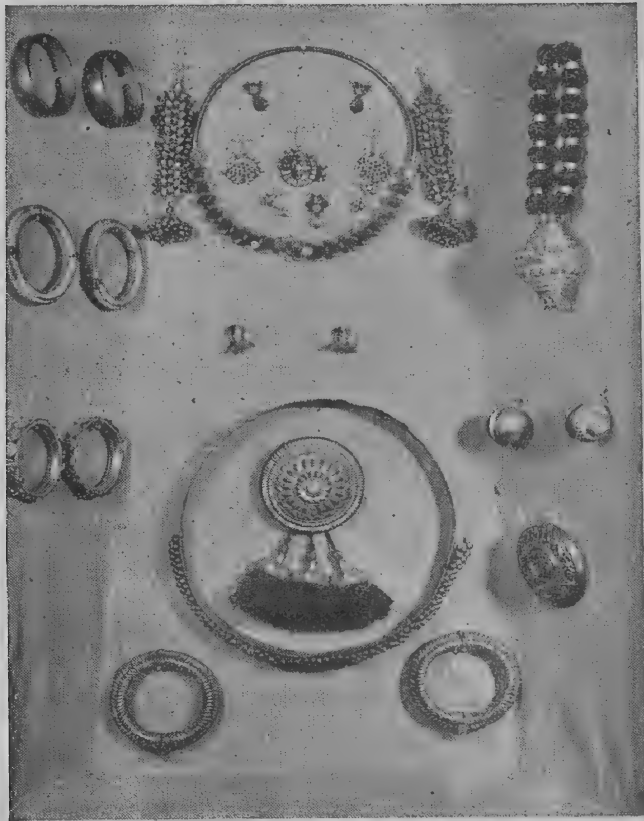


Fig. 18. A COLLECTION OF JEWELS AND ORNAMENTS IN COMMON USE.

of them are gold-gilded. Ornaments worn by the Harijan ladies are displayed in the third side. *Pavala malai* (coral necklace), *kasais*, lead and glass bangles, lead rings for toes, ear and nose screws, and also the *araimudi* (or the "Genital shield") worn by young female children are included. The fourth side exhibits ornaments of the Muslim ladies, which include gold-gilded flower ornaments and semi-lunar ornaments for the head, as well as nose-hooks, necklaces (similar to *thalis*), bangles, wrist-bands, and also a hair-ornament of molluscan shells. Ornaments worn by the Nattukkottai Chettiar (Nagarathar) ladies are displayed in the fifth side of the show-case. They consist of a *peria thali*, a *siria thali* and a few ear-ornaments. All of them are gold-gilded. Ornaments of the Koravars are displayed in the sixth and the only yet-remaining side of the show-case. They consist of *pasimalais*, ear-rings, and *jimikis*. An oil-painting of a gypsy woman, which was executed by the late Sri K. Venkatarangam Raju of this Museum, is

exhibited on the wall. It belongs to the modern school of painting (already referred to elsewhere), and shows how these ornaments are worn.

Ornaments that are required for the make-up of the artists in folk-dancing are exhibited in an oblong sloping-case near the wall. They are all made of soft, light wood, and covered up with bits of plain and coloured glass and gold paint.

Different types of *thalis* and *gundus*, *pottus* and *thayathus*, worn by the Hindu married women of South India, are attractively displayed in two wall-cases. The *thalis* which originally arose as mere objects of ornaments, have now come to stay as sanctified tokens of wedlock among the South Indian Hindus. They are used either in two or more numbers, according to the financial status of the individuals. The *gundus* are much smaller in size. They are used in combination with the *thalis*. The *pottus* are small concavo-convex pieces which are also worn around the neck in addition to *thali*. All these pieces on display are gold-gilded ones. The un-married Hindu ladies do not wear them. The *thalis* are snapped and discarded by the Hindu women when their husbands pre-decease them.

Bashingams (ornaments used by the men-folk in marriages) are attractively displayed in another wall-case. Parts of them are also gold-gilded.

Rosaries

The rosaries are classified into four groups according to the community which patronises them, and arranged rather community-war. Thus there are the Vaishnavite, Saivite, Muslim and (Catholic) Christian rosaries. They are used for religious purposes.

Navagraha Plates

The exhibits of Navagraha plates consist of nine, small, gold-gilded plates, each having the symbolic figure of one of the nine "planets" of the Hindu astrology. They are believed by the Hindus to wield an all-powerful influence over an individual's personality, prosperity, conduct, etc. They are Budha (Mercury), Shukra (Venus), Chandra (Moon), Guru (Jupiter), Surya (Sun), Angaraka (Mars), Kethu, Shani (Saturn) and Rahu. Sun and moon are also considered as planets by the Hindu astrologers. Kethu and Rahu are the *asuras* who are endowed with immortality. The former has a human body with a serpent's head; and the latter, a serpent's body with a human head.

Salagramas

Black specimens of fossil *Ammonite* found in the River Gandak, are known as *Salagramas* and worshipped as one of the forms of Vishnu. Included in this group are also eight black stones each of which shows a pair of feet engraved on it. They symbolise Vishnu's feet and are worshipped as such.

Votive Offerings

The votive offerings include those materials which are offered to the deity, Mariamman, by the devotees in fulfilment of a vow to do so if any particular ailment of theirs is cured. If the ailment is connected with feet, figures of a pair of feet in gold, silver or brass rakes, are thus offered; and so on, in respect of hands, eyes, etc. The collections include representations of all these figures (some of them silver-plated), as well as of the weapons that are said to be wielded by the deity.

In another sloping case, are exhibited wooden models of the equipments and utensils used in *yagams* or animal (goat) sacrifices. These models portray the types of knives, ladles, churns, linear mortars and pestles that are used at the *yagam*. An oil-painting of Kundala Dikshitar, the first Brahmin to perform the goat-sacrifice in the erst-while Pudukkottai State, is also hung on the wall. It belongs to the modern school of painting (already mentioned elsewhere) and is important as portraying an ethnic group. Its author is the late Sri K. Venkatarangam Raju of this Museum.

PRE-HISTORY

Natural caverns and rock-shelters, suggestive of the earliest human abodes, exist around Pudukkottai. The Neolithic and Iron Age finds in this area, give a picture of the dense population in the region since the Palaeolithic period. It is not surprising therefore that this area is rich in prehistoric burial sites. These sites are generally found situated on elevated grounds and near water-courses. Disposal of the dead in the pre-historic days, is found to be of either of three ways: the dead persons (probably women) are buried straight-way in pits (graves) dug for the purpose; or they are put in large pyriform (or pear-shaped) urns and buried; or they are put in under-ground cells or cists that are built of stone-slabs. The burials are dated as pre-historic only if Neolithic implements are found in them. If however iron implements and vessels are also found, they are said to belong to the Iron Age. Potsherds strewn on the ground, buried urns seen partly exposed, laterite or granite boulders arranged in a circle, help us recognize these burial sites,



Fig. 19. PARTLY-EXPOSED URN-BURIAL (KALASAKADU).

generally. While the plain system of burials has not yielded much material for study, the other two types, viz., the urn-burial and the cist-burial, contain objects of importance.

Urn-burial

In the urn-burial, the man is placed in a sitting posture inside a large urn or earthenware pot which is then placed in a pit. The urn is then filled with soil and cereals for the use of his departed spirit. In addition to the cereals, sometimes stone tools are also kept inside the urn. The pot is then closed with an earthenware lid. The pit is filled in and a stone-slab is placed on the top. Some more soil is poured over the stone-slab and finally another, large, oval-shaped stone is placed on top of the whole. Around this second stone, upright stones are planted, which completes the burial. In some instances weapons, like swords, daggers, spear-heads and arrow-heads with handles, are found buried with their points turned downwards, outside and around the urns.

Most of the urns are without ornaments, and contain smaller pots and at times bronze vessels, too. The smaller pots sometimes disclose personal ornaments, like bronze bracelets, chank shells, nose-rings and beads of glass and carnelian. One of the three small pots inside an urn, unearthed at Mottaimalai, has yielded two polished stone weapons, a stone spear-head with a handle and a scraper.

Cist-burial

The cist-burials are also known as Megalithic Dolmens. The cists are situated in the centre of a circle of large laterite boulders and are generally pin-pointed by stone-slabs projecting from underground. Broken pieces of stone-slabs and boulders may be seen at a depth of a couple of feet below the ground. Below them are four cells, the floor and sides of which are all formed of stone-slabs. The cells have a rather peculiar arrangement. There is a smaller eastern cell, to the west of which are two, larger, oblong cells which have a common partition between them, running from east to west and thus separating a northern and a southern cell. The northern cell has another cell above itself, forming an upper storey as it were. The southern cell communicates with both the upper, and the lower, northern cells, and through a hole in the partition slab, with the eastern cell. All the holes in the stone-slabs are plugged with earth and thinner slabs. Finds of any importance are collected only from the northern and southern cells. They are directly baked earthenware utensils of different shapes and sizes, and iron weapons of different sorts; saucer-shaped iron vessels, fragments of a bronze vessel and stone ball (probably a missile) are also reported in a few isolated cases.



Fig. 20. A VIEW OF AN EXPOSED CIST (NEAR SITTANNAVASAL)-

A number of urn-burials in the Pudukkottai region were opened in 1917, and over thirty Megalithic Dolmens were opened in 1935. From these excavations 152 specimens of potsherds and 72 specimens of iron weapons of various kinds have been unearthed and exhibited in the Prehistory gallery, into which the Ethnology gallery leads rather unostentatiously.

The Pre-history gallery begins with two large, and one small, pear-shaped urns, the smaller one having a lid. Besides these there are also two globoidal urns.

In the centre of the Pre-history gallery, there is an oblong vertical show-case with desks in front and back. The central vertical, and the front sloping (desk), parts of the show-case contain pots, lids, ring-stands, potsherds, etc. that were unearthed from the burial sites around Pudukkottai. The rear sloping (desk) part contains iron weapons and ornaments collected from the urn-burials in the Pudukkottai area, as well as the iron weapons from the burial sites of the Tirunelveli District. Iron weapons from the urn-burials in the Pudukkottai area are swords, daggers, scrapers and short, pointed weapons. Their counter-parts from the Tirunelveli District show only minor differences. The Tirunelveli finds include three bunches of iron-work. Each bunch has a loop at the top (probably for suspension), and branches down into four rods at the bottom. The tips of these rods divide again into four branches, each of which ends as an upturned hook.

The ornaments dug out from Kalaşakkadu, near Pudukkottai, give some life to this otherwise grim and dry subject of study of burials. They comprise glass and carnelian beads with holes for stringing. Along with them, are exhibited three bangles, two of which are of bronze and one of chank. They have come from the Pudukkottai Town Forest.

The top of this vertical show-case, is bedecked with photographs of pots, ring-stands and lids, obtained from the Megalithic Dolmens, which supplement the actuals inside the show-case.

At either end of this vertical show-case and arranged between two pillars, is an oblong sloping case. One of them contains pots obtained from the opening of Megalithic burials around Pudukkottai, and the other contains potteries and potsherds from the burial sites in the Tirunelveli District.

At the far end of the gallery, Old and New Stone Age implements are exhibited. The Old Stone Age implements or palaeoliths are from the Chingleput District, and the New Stone Age implements are from the Madras State in general. Besides these, there are also specimens of celts presented by the Government Museum, Madras.



Fig. 21. THE SITE OF A CIST-BURIAL (TAYINIPATTI).

The Stone Age artifacts of Pudukkottai, the area around which is believed to mark the southern-most limit for the Stone Age industries, are exhibited in a separate show-case. The Pudukkottai artifacts in the Museum collection, are fourteen in number. One of them hails from the Tirumayam Taluk, nine are from the Alangudi Taluk and four are from the Kulathur Taluk. The Tirumayam specimen is a present from Sir Alexander Tottenham who has already been referred to elsewhere. It is a waste flake of flint and should have struck off while making an early palaeolith by the *Clacton technique*. The Alangudi specimens consist of two cores, five flakes and two bifaces. All of them except the bifaces are of brown chert. The bifaces are of quartzite. But for the appearance of a few flake-scars on them, the flakes can pass off as ordinary stones. The bifaces show a more controlled technique and for that reason belong to a later horizon than the flakes and cores (which are also of the *Clacton technique*) do. The Kulathur specimens also include a biface of the same kind as the Alangudi bifaces, besides an implement and two missiles. The Kulathur biface is much worn out and decomposed (lateritized). Both the implement and the missiles have been unearthed from cist-burials of the Iron Age. The missiles are small, spherical stones that are used in the stone-slings which have been described elsewhere. It is really surprising to know that in the Pudukkottai area, the use of stone-sling is a die-hard from the days of cist-burials in the misty past.

On the left of the exhibits of Stone Age implements, are displayed two bronze vessels which are buried with valuables in them. They contain a pair of loops at the neck, for securing the lid in place. In India, both the Iron Age and the Bronze Age appear to have begun almost together.

To the right of the Stone Age implements an excellent model of a cist-burial in miniature, is on display. It furnishes a true picture of the burial arrangements in the field.

Broken bits of glass bangles excavated from the burials, show beautiful patterns in colour, and are exhibited in a wall case on a pillar.

A series of photographs of the burial sites around Pudukkottai are exhibited at the far end of the gallery. Two distribution-maps, hung on pillars, show the location of prehistoric burial sites and Stone Age sites in the Pudukkottai area.

Two charts displayed on pillars, one near the model of the cist-burial, and the other near the largest of the burial urns in the collection, furnish the details of the these two burials respectively.

Historical Records Section

In the Historical Records Section, the Huzur Records and a Palm-leaf Gazetteer of the old Pudukkottai State are exhibited.

HUZUR RECORDS

There are some volumes of Huzur Records of Pudukkottai, exhibited along with the Palm-leaf Gazetteer. Persian, Urdu and Tamil were the languages in use in the correspondences between the Tondaiman Rulers of Pudukkottai, the East India Company and the Nawab of Wallajah. After Thanjavur was annexed by the East India Company in 1799 the Maratha officials of that place took up service under the Tondaimans, and subsequently there was a long succession of Maratha Dewans, Judges and Accountants. Till late in the nineteenth century (when English was made the official language in Pudukkottai, for political correspondence) all records were kept in Marathi.

Letters from the Tondaimans are very helpful to the students of South Indian History of the British period.

PALM-LEAF GAZETTEER

The Palm-leaf Gazetteer of the (then) Pudukkottai State, compiled in 1813 A. D., furnishes a statistical account of the administration of the Pudukkottai area in that period. It was compiled under the orders of Raja Vijaya Raghunatha Raya Tondaiman (1807-25 A.D.). It is written in Tamil on *cadjan*. It is a very early and complete gazetteer of the locality. From this gazetteer, it is learnt that the area was divided into five *taluks*, and each *taluk* into a number of *makanams*. A complete statistical account of physical features, irrigation channels, temples, roads, imports, exports, etc., for each *makanam* is furnished.

Archaeology Section

The Archaeology Section saw considerable improvements in the year 1923-24. It is divisible into three smaller units, viz., Inscriptions, Sculptures and Temple Architecture. The inscriptions on exhibition are divisible into copper-plate inscriptions and stone inscriptions. The sculptures in the gallery are divisible into three groups (based on religion), viz., Hindu, Jaina and Buddhist sculptures. The Hindu and Jaina sculptures belong to Pudukkottai and its vicinity. The Buddhist sculptures belong to the Amaravati *stupa* of the Andhra State, and have come as presents from the Government Museum, Madras. They are in marble, while the Hindu and Jaina images are in stone and bronze. In style, the sculptures are typical of the periods to which they belong, and of the ruling dynasties that patronised them. The temple architecture of Pudukkottai area (and thereby of South India, too), are illustrated not only by photographs but also by a couple of models made of plaster-of-Paris.

INSCRIPTIONS

There are thirteen exhibits of copper-plate grants (all numbered from 24 to 36) and three exhibits of inscriptions in stone. Two of the copper-plates (Nos. 33 and 35) however together make up but one piece, perhaps.

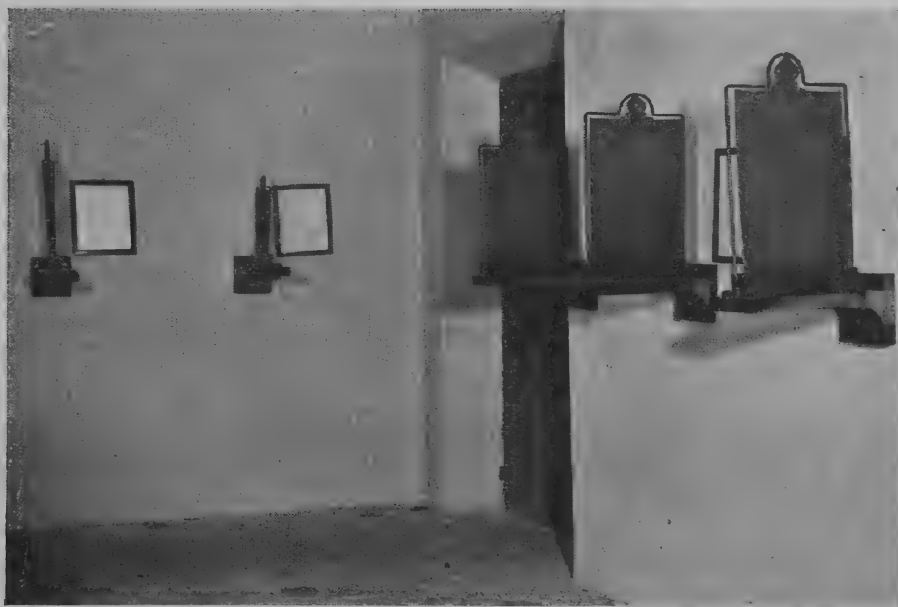


Fig. 22. A VIEW IN THE EPIGRAPHY GALLERY.

Copper-plate Inscriptions

Some of the plates are inscribed fully both on the obverse and on the reverse, or fully on the obverse and partially on the reverse, or only

on the obverse either fully or partially. All the plates are rectangular, and with the exception of two of them (Nos. 33 and 34), have a *sikharam* on top. The *sikharams* are of different shapes. Some of the *sikharams*



Fig. 23. THE DESIGN ON THE SIKHARAM OF ONE OF THE COPPER-PLATES.

contain engravings which appear erased either partly or fully on some plates (probably by usage). The designs when present in full, consist of a floral *tiruvachi* enclosing the sun, the moon (crescent) and a *vamana* (a dwarfish Brahmin) holding an umbrella and a *kendi* (a small pail), and standing on a lotus pedestal. On one plate (No. 30), however, the *sikharam* of which is small, the lotus pedestal, the *tiruvachi*, the sun and the moon are wanting, and the *vamana* alone is seen.

The inscription on ten plates is late Tamil and written in Tamil and Grantha characters. The script on three plates (Nos. 33, 34 and 35) is markedly Telugu. All the plates, excepting those which are numbered 33, 34 and 36, contain prominently the phrase "Sri Rama Jayam" in Telugu characters.

Nine plates mention Raja Sri Raja Vijaya Raghunatha Raja Bahadur Tondaiman (1789-1807) of the Tondaiman Dynasty of the Pudukkottai State, as the donor. Adappan Kuttappan is mentioned as the donee on four of the Tondaiman's plates; Adappan Subramanyan on two; Ammani Ayi Avergal, wife of the elder brother of the Tondaiman on one; and Shreevaishnavas of Ambalkudi and Koiru on one. The copper-plate No. 32 does not disclose the donee nor the gift,

but appears to be an unfinished copy of the original that must have been issued by Raja Vijaya Raghunatha Tondaiman. All these plates relate to donation of lands and endowments of gifts.

The plate No. 34 establishes the geneology of Vijayaraghava, the great grandson of Achyuta Vijayaraghava Nayaka of Nedugondapura. It records also the grant of the Village of Champakamannarupuram by him to a few Shreevaishnavas in 1659 A. D.

The plate No. 36 is rather interesting. It does not disclose by whom, nor to whom, it was issued. It is more of the nature of a holy charter extolling the virtues of charity and trust, and also ranking the latter as superior to the former.

Stone Inscriptions

There are three stone slabs of epigraphic interest, exhibited in the corridor, close to and adjoining the gallery of copper-plate grants. One of them is a Narasimha Chakram, and the other two are records of merchant guilds. It will be interesting to know something about them.

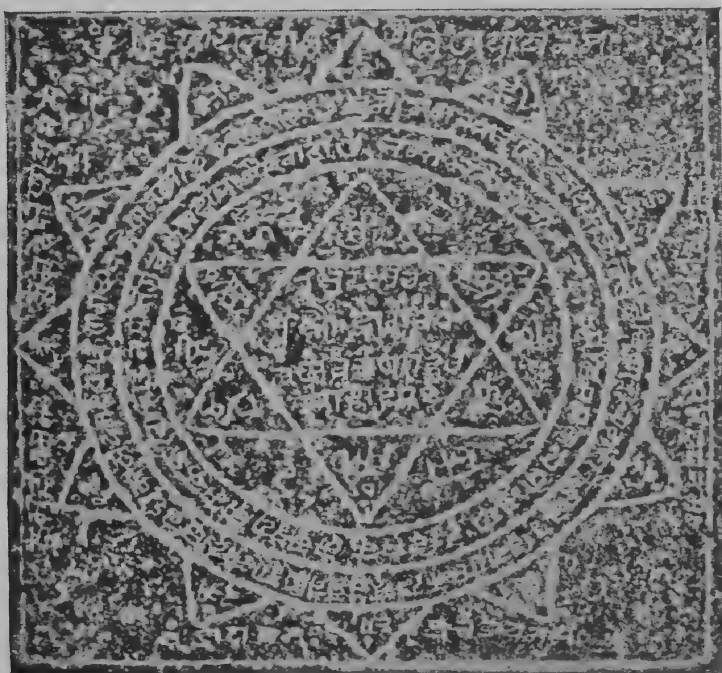


Fig. 24. NARASIMHA CHAKRAM.

A *chakram* consists of geometrical designs on metallic plates or paper, enclosing abbreviated *mantras* for protection and blessings from gods or goddesses. When small it is carried about in a *thayathu* (referred to elsewhere). The exhibit is a large *chakram* in stone from Pudukkottai, and pertains to Narasimha. It might have been under worship

for protecting the locality against evils. The central part contains *bija aksharas*, etc. of Garuda, Virabhadra, Ganapati and the presiding deities of the directions. It is bounded by twelve angles which are formed by two crossed triangles, and which contain the *bija aksharas* of Sakti, Ganapati, Subrahmanya and Sudarsana. These angles are surrounded by two circular areas, the inner with prayers to Mahalakshmi for grant of wealth and fame, and the outer with prayers to Narasimha for destruction of evils. The outer circle is fringed by twelve triangles which contain the *bija aksharas* of Sakti and Narasimha. Near each of the four margins of the slab, are recorded salutations to two *parivara devathas*. The script is Modi (an eighteenth century form of Nagari).

The trade in medieval India extended not only from Chera, Chola and Pandya kingdoms in the south to Nepal in the north, but also from South India to Ceylon, Burma and East Indies. It was controlled and protected by guild or corporation of merchants, known as *nagaram*. There were several *nagarams* all over India, each with its own mercenary army. The *nagarams* were also munificent and charitable, made good many endowments, laid and maintained roads, received and managed gifts for temples, etc. Two earliest inscriptions of such *nagarams*, discovered at Munasandai, are prominently exhibited in the Museum. The date ascribed to them is 10th century A. D. They relate to endowments for the maintenance of an irrigation tank at Munasandai.

HINDU SCULPTURES

Hindu sculptures of the Pallava period are of a simple style, and of natural pose and expression and do not have heavy ornamentation. Gods and goddesses of the early stages are two-armed, and become four-armed in the later stages. Durga has a benign countenance and eight arms, and holds a spear aimed at a demon. Ganesas have a prominent forehead, and their trunks are sometimes curled to the right. The Pallava influence prevailed from the 6th to the 9th century A. D. The sculptures in and around Pudukkottai show a gradual transition from the Pallava style (7th century A. D.) to the Chola style (9th to 12th century A. D.). The Chola sculptures differ from the Pallava ones in pose as well as in profusion of ornamentation. Pandya style took the field between 12th and 14th centuries A.D.

Hindu Sculptures in Stone

These are arranged at three different but adjacent places in the eastern wing of the buildings : (1) the corridors around the second open yard, (2) the oblong hall at the exit and (3) the verandah facing the exit and road.

The corridors contain besides sculptures, some photographs, colour pictures and charts relating to several protected monuments in India. The Hindu sculptures exhibited here are all of stone and belong to Nartamalai, Kodumbalur, Thiruvengaivasal, Kudumiyamalai, etc. Some of them are described below.

Saptamatrikas form a separate single, large, conspicuous group. The group includes all the Saptamatrikas, viz., Brahmi, Maheswari, Kaumari, Vaishnavi, Varahi, Indrani and Chamunda. They are seven goddesses who are the feminine counterparts of the masculine divinities. Brahmi is sculptured like Brahma, Maheswari like Maheswara, Kaumari like Kumara, Vaishnavi like Vishnu, Varahi (a short



Fig. 25. KAUMARI, A SCULPTURE IN STONE.

woman with an angry face and a plough) like Varaha, Indrani like Indra and Chamunda (a terrific woman) like Yama. They carry the same arms, ride the same *vahanas*, wear the same ornaments and carry the same banners as their masculine counterparts do. But in sculptures they all appear as seated on *padmasanas* with their hands in the *abhaya* and *varada* poses. When endowed with four hands, the spare hands carry the appropriate weapons. The Saptamatrikas in the Museum have come from Nartamalai and are all ascribed to the 9th century A.D. They show Pallava influence.

Yoganarasimha is next to the Saptamatrika group. Vishnu (one of the three principal Hindu gods) in one of his incarnations, took the form of Narasimha (lion-man) and disembowelled Hiranyakasipu at twilight, as the latter had a boon from Brahma, according to which he (Hiranyakasipu) could not be killed by man nor by beast, by day nor by night. He (Vishnu) then had to practise *yoga* in order to regain control over his own fury, when he became known as Yoganarasimha. The image is depicted in the squatting posture, with the legs crossed in front and the knees bent and raised. The image comes from Nartamalai



Fig. 26. VEENADHARA DAKSHINAMURTI, TUNING VEENA IN THE "REVERSE" DIRECTION (STONE).

and belongs to the period from the 9th to the 10th century A. D. The style of sculpture is early Chola.

Dakshinamurti is Siva as an exponent of *yoga*, music, etc., when he does not have Devi near him. As a master, expounding music, he is seen sitting or standing and also playing upon the *veena*, and then he becomes known as Veenadhara Dakshinamurti. He has three eyes and four arms. Both the front hands hold the *veena*. The back left hand holds the *aksha-mala*, and the back right the *trisula*. This sculpture comes from Nartamalai and is dated 9th to 10th century A. D., and represents early Chola style.

The Saptakanya panel resembles the Pallava images in style. It however, belongs to the Chola period and is dated 10th century A. D. The change-over from the Pallava to the Chola style was smooth and gradual. The panel hails from Kodumbalur.

Jyeshtadevi is the destroyer of wealth and prosperity and the opposite of Lakshmi who bestows them. She is a terrific and powerful figure and carries the *kapala* and *bana*. Her banner contains a crow. She is two-armed and generally accompanied by a male attendant. She was under worship till 16th century A. D. There are two images of this goddess in the Museum, one belonging to Nartamalai and dating from 900-1000 A.D., and the other belonging to Thiruvengaivasal and dating from 1000-1100 A. D. The latter is sculptured in the Chola style.

Vishnu is recognised very easily by his *chakra* or disc and *shankha* or conch (referred to as the Chank in the pages relating to the Zoology Section). He wears a *kirita*. He is four-armed with *chakra* in his back right hand and *shankha* in his back left hand. His front right hand is held in the *abhaya* pose, while his front left hand rests on the hip. The Vishnu image in the Museum is in the Pallava style and belongs to 900 A. D. This standing figure of Vishnu is said to be Yogasthanakamurti, in which form he is worshipped by *yogis*.

Chandikeswara is the custodian of the property of a Saivite temple. His weapon is an axe. His hands are held in the *anjali* pose and sometimes carry a flower-garland. The locality of the image is not known but the sculpture is dated to 8th to 9th century A. D.

Surya, the Sun God, has only one pair of hands generally, and carries a lotus flower in them. His head is shown as having a halo around it. He travels in a seven-horsed chariot which has only one wheel (to overcome friction and complete his long journey across the firmament in time). The image in the Museum, is from Thiruvengaivasal, and dates from the 10th to 11th century A. D. It is sculptured in the Chola style.

Shanmukha is one of Subrahmanya's several names, and means six-faced. He is said to have acquired this feature from out of peculiar circumstances relating to his birth. Each of six Krittikas conceived

and begot a son. All these sons were soon united in one single being with six heads, twelve arms, etc. In Iconography, Shanmukha is recognised by the possession of six faces, twelve eyes and twelve arms. His vehicle is peacock. His banner contains the picture of a fowl. His hands have *sakti*, *bana*, *khadga*, *dhvaja*, *gada*, *dhanus*, *vajra*, *padma*, *kataka*, etc. One of his right hands will be in the *abhaya* pose, and one of his left hands in the *varada* pose. The early Chola sculptures portray him as two-armed, with the hands in the *chinmudra* pose. The Shanmukha images in the Museum belong to 1800—1900 A.D., and show six faces and twelve arms. They hail from Nartamalai.

The Hindu sculptures in stone in the hall near the exit, consist mainly of the chieftains, *rishis*, dancers, lion and *yali*, in addition to the figures of gods. They range in date from the ninth to the tenth century A. D., and belong to Kodumbalur. Some of them are originals, while others are replicas in plaster of Paris. Important ones among the stone sculptures represented here, are mentioned below.

Bikshatanamurti is a mendicant form of Siva. In this form Siva is represented as having already done his terrible deeds, and not as one still engaged at them. Bikshatanamurti is naked like a beggar who begs for cooked rice. There are sandals on the feet. The demon, Gundodara, is also shown. The image is 3-eyed and appears to rest on the left leg which is planted firmly on the ground, while the right leg is shown slightly bent as in walking. Though naked the figure shows ornamentation.

Ardhanareeswara is a combination of both male and female parts of Siva. Some people hold the belief that Siva can discharge his duties, only when he is combined with Sakti. His consort, Parvati, and Sakti being one and the same, he is sometimes sculptured as this combination. His right half is male and his left female, in every detail. The right half of the forehead has one half of the third eye of Siva, and the right half of the head a *jatamakuta* with a crescent moon. The left half of the head has the hair in a fine knot, and the left half of the forehead a half *tilaka* continuous with the incomplete third eye. The *tilaka* and the third eye are not clear in the exhibit. Similarly, other parts of the two halves have all those features which characterise Siva or Parvati as the case may be. The sculptor who made this image has dextrously handled the very difficult task, and deserves the admiration of all.

Tripurantakamurti is that form of Siva, which destroyed the three sons of Tarakasura, who took the form of three cities and started giving trouble to the *devas*. Siva answered to the S.O.S. call from the latter and with a special bow and arrow destroyed the Tripura demons. The image of Parvati (as Tripurasundari) generally accompanies that of Tripurantaka. In the Museum, the Tripurantakamurti group of

sculptures, consisting of Tripurantakamurti, Tripurasundari and Tripura (Demon), is both beautiful and rare. These sculptures were unearthed only in the recent thirties, from a field at Kodumbalur. The exhibit is a cement-cast of the original that was in stone.



Fig. 27. TRIPURANTAKAMURTI WITH A BOW ON HIS LEFT. IT IS A CEMENT-CAST OF THE ORIGINAL (STONE).

Gajasamharamurti is another form of Siva, that was responsible for killing an *asura* who took the form of an elephant and started plaguing the pious. Siva came out of a *linga*, killed him, took the skin of the elephant, and wore it as the upper garment. His hands are shown holding the skin and the tusk of the elephant. He is shown standing on the right leg which rests on the elephant's head. The image has ornaments. Parvati is portrayed on the left of Gajasamharamurti, with her child, Skanda, in her hands.

Vali-Sugriva fight is a sculpture of 1800 A. D. from Tirumayam. Two monkey princes (brothers) quarrelled and Sugriva, the weaker and younger, was forced into exile. With Rama's help he killed his stronger

and elder brother, Vali, and became the king of monkeys. The fight between the two brothers is beautifully depicted.

The Hindu sculptures in the verandah facing the road, include Saivite and Vaishnavite figures as well as a chieftain and a hero.

Aghoravirabhadra in this verandah is a terrific form of Siva, said to have been assumed when he destroyed the sacrifice (*yagna*) by Daksha who was his (Siva's) father-in-law and who ill-treated Sati (Parvati or Siva's wife in her earlier birth). The image is eight-armed and three-eyed. There is a tusk protruding from each corner of the mouth. The hands carry a snake, sword, *damaru*, *mriga*, bow, etc. One leg wearing a sandal, rests on the head of Daksha, and the other leg is rather hidden. The arms wear armlets and wristlets. There is a *yagnopavitha* in addition to a garland (probably of skulls). The image belongs to the 17th century A. D.

Two Vishnu images in the verandah at the exit date from the 12th century A.D. Locality of one of the Vishnus is Valamangalam, but that of the other is not known. Both the Vishnus are sculptured as Yogasthanakamurtis in the standing posture. Vishnu's consorts, Shree Devi and Bhu Devi, are also represented, the former dating back to 15th and the latter to 12th century A. D.

Ramanuja is a Vaishnavite teacher or preacher. The followers of Vishnu have saints and teachers, the former being known as *alvars* and the latter as *acharyas*. Ramanuja is an *acharya*. He is a historical figure of the 11th and 12th century A. D. He founded the system of qualified monism, known as the *visishta advaitam*, as against Sankara's pure intellectualism. In the days when Venkatesa temple at Tirupati was the bone of contention between the Saivas and the Vaishnavas (because of the two-fold nature of the image), and when the Saivas were about to carry the day, it was Ramanuja who saved it for the Vaishnavas. The image in the collections belongs to the last century, and its locality is not known. It is a seated figure with its hands in the *anjali* pose and with a *namam* on the forehead.

A war-chief (Marava or Kalla) with a sword buckled to his waist is also represented. His hands are in the *anjali* pose and his feet are bare — characteristics of devotees or donors who contribute to the setting up of a monument. The image hails from Kudumiyamalai, belongs to the 17th century A.D., and throws light on the type of costumes, etc. in use in that period.

A hero stone commemorates a hero or his special deed of valour (even when he is alive). This form of admiration is extended also to animals that die a hero's death! Sometimes the figures of sun and

moon, suggestive of immortality, are included in these sculptures. A hero dying in battle goes to a separate heaven, the *Veeraswargam* — so the Hindu belief goes. Generally therefore, the hero is depicted at his best in the panel; celestial damsels ready to carry him to his chief deity, hover above him in a separate panel; and he (the hero) worships his deity higher up in a third panel. The hero in the exhibit is a Chola archer from Mullaiyur.

Hindu Sculptures in Bronze

The Hindu bronzes in the Museum, can be classified into four groups: Saivite, Vaishnavite, Gramadevatha and Miscellaneous. The Saivite group consists of the various forms of Siva and of the members of his family, and a few images of Siva-bhaktas. The different forms of Siva in the collections are Nataraja, Somaskanda, Sivasukhasanamurti



Fig. 28. SIVASUKHASANAMURTI, A SCULPTURE IN BRONZE.

- and Chandrasekhara. Parvati is represented as Durga, Bhadrakali, Sivakamasundari and Uma. Siva's son, Ganesa, is shown both standing and sitting. The collection of Siva-bhaktas contains Nandikeswara, Sambandamurti (Sambandar), Appar and Manikkavachakar.

Chandrasekhara is sculptured as a bachelor standing erect, and holding an axe in the back right hand and a *mriga* in the back left. His front right hand is in the *abhaya* pose and his front left in the *varada* pose. There is a conspicuous, crescent-shaped moon on his head-dress. The figure is erect without any bend in the body. It has three eyes and is plentifully ornamented. It is sculptured in the early Chola style, and comes from Tanjur.

Inclusion of Uma by his side makes him Umasahithamurti, and if he holds her by the left hand in an embracing posture, he becomes Alingana Chandrasekhara.

Sivasukhasanamurti depicts Siva as a bachelor who is seen seated alone. The image here is seated erect, his left leg bent and resting on the seat, and his right leg hanging down from below the knee. He is four-armed with a *parasu* in his back right hand, and with a *mriga* in his back left, while his front right hand is in the *abhaya* pose and his front left hand is in the *simha-karna* pose. The image comes from Kilakurichi, and is dated 11th to 12th century A. D.

Nataraja or Natesa is that form of Siva, which represents him as dancing in ecstasy. He is said to subdue Kali's pride by this dance. The image from Tiruvarangulam, which dates from 11th century A.D., holds a drum in the back right hand and a burning flame (*agni*) in the back left. The front right hand is shown in the *abhaya* pose and the front left in the *gajahastha* pose. The latter keeps pointing to the left foot which is raised and swung to the right. The right foot stands on the prostrate demon, Muralaga.

Alingana Chandrasekhara is that form of Siva, which holds Parvati in his embrace. Siva when portrayed as a bachelor standing erect with an axe in his back right hand and a *mriga* in his back left hand, and with a conspicuous crescent-shaped moon in his head-dress, he is known as Chandrasekhara. Chandrasekhara, when depicted as standing and rather embracing Parvati by his front left hand, is said to be Alingana Chandrasekhara. Unlike a few other instances recorded and published elsewhere by various other authors, the bronze piece here is unique in that the image of Siva is shown standing almost erect and upright. Parvati is shown slightly leaning towards Siva, as if drawn nearer to him by his embracing left hand which curves round her back and holds her left upper arm. Siva's body is erect without any bend, but for a slight tilt to the right as a result of having his right foot a little forward. The specimen is dated 9th to 10th century A. D., but its locality is not known.

Somaskandamurti is that form of Siva, in which he is seen seated with Parvati by his side and with their child (Skanda) in between them

both on one and the same seat. In the exhibit Siva and Parvati are seen facing the viewer, and their child stands in between them. The specimen is from Vellanur and dated 10th century A. D.



Fig. 29. ALINGANA CHANDRASEKHARA, A SCULPTURE IN BRONZE.

Bhadrakali is said to be a fierce feminine creation of Parvati (Siva's consort). The image in this Museum, has only two pairs of arms, as against the conventional number of 4 or more pairs. Its locality is not known and its date is 13th to 14th century A. D.

Durga is a fighting goddess with Vaishnavite emblems in the back pair of hands. There are two images in the Museum, both from an unknown locality. One of them is dated 1900 A.D. and the other is not dated. In the dated specimen the back right hand carries a discus or *chakra* and the back left, a conch or *shankha*. The front right hand is in the *abhaya* pose, and the front left in the *varada* pose. The image is rather crudely worked and also peculiar in not having the breast-band. The non-dated specimen discloses a much better workmanship. In it the positions of the disc and the conch appear interchanged in respect of the left and right sides. This image has a breast-band and also a *prabha* that comes up from the pedestal at the base. The pedestal bears a bull's head.

Uma is an alternate name for Siva's consort, Parvati, and has only a single pair of hands. There are three images of Uma in the Museum; all of them are from an unknown locality. One dates from 10th to 11th century A. D., and another from 11th to 12th century A. D., and the third from 12th to 13th century A. D. The first and the third are in the standing posture, the former being much smaller than the latter. The smaller image has also a *prabha* coming up from the lotus-pedestal. The left hand hangs by the side, and the right hand is in the pose of holding a lotus bud which however appears to have dropped off. The other standing image of Uma is also similar, but with these differences: (1) the right hand holds a lotus bud which has not dropped off, and (2) the *prabha* is absent. The seated image of Uma has a lotus *peetam*. The right hand holds a lotus bud, and the left is in the *varada* pose. The right leg is folded on the *peetam* and the left is shown dangling from below the knee.

Sivakamasundari is an image of Parvati, seen in association with Nataraja. There are two images of this deity in the gallery: one dated 1100 A. D. and coming from Tiruvarangulam, and the other dated 1800—1900 A. D. and coming from an unknown locality. The Tiruvarangulam specimen looks as if it is meant to accompany the Nataraja image of the same locality and date (already described). In broad details it agrees with the image of standing Uma of 1200—1300 A. D. (already referred to) and excels it in respect of ornamentation. The image of Sivakamasundari of the latter period is a little smaller but more profusely ornamented than the older one.

Ganesa is Siva's eldest son and has the head of an elephant. He is generally considered to be a bachelor. He is four-armed. The back right hand carries a goad, and the back left a rope (or noose). The front right hand holds one of his broken tusks, while the front left has a (rice) cake. The specimen in this particular group of Saivite bronzes is in the standing posture. It comes from Kilakurichi and is dated 1100 A. D. The collection of miscellaneous bronzes has its seated and dancing forms. The seated images are generally referred to as Ganapatis.

Nandikeswara is the personified form of Siva's vehicle which is the bull, called Nandi, and which is also worshipped. He is four-armed; the back right and left hands carry Siva's emblems of *sula* and *mriga* respectively, and both the front hands are held with their palms joined together in the *anjali* pose. A crescent-shaped moon is also depicted over the head. The specimen in the Museum belongs to the period 1100—1200 A. D., and hails from Kiranur.

Appar is a mortal who later came to be an apotheosised saint and worshiped as such. He is portrayed with his hands in the *anjali*

pose, and as clasping a spud with his elbow. *Rudhrakshas* strung together as a necklace are also seen worn around the top of the head, as many Saivite devotees do even to this day. He is reputed as the chief author of the *Tevaram* hymns. The exhibit in the Museum is dated 1100-1200 A. D. Its locality is unknown.



Fig. 30. APPAR, A SCULPTURE IN BRONZE.

Manikkavachakar is another apotheosised Saivite saint. In the days when Saivism was feared to be losing its ground to Buddhism (600-700 A. D.) he worked for, and championed the cause of, Saivism. He was the author of *Tiruvachakam* hymns. His right hand holds a small necklace of *rudhraksha* beads and is kept in the *upadesa* pose, while

his left hand contains a leaf of manuscript. The locality of the exhibit is not known, but it belongs to the period, 1100—1200 A. D.

Sambandamurti is no other than Thirugnana Sambanda who lived in the early part of the 10th century A. D. He was nourished, it is said, from Parvati's own milk. He composed what are called the Tirupattu hymns. He is held in great reverence as one among the sixty-three famous Saivite saints. There are four bronze sculptures of Sambandamurti in the gallery. One of them portrays him as child and the other three portray him as dancing in ecstasy. The right hand of the child keeps pointing (upwards) to Siva, and the left hand holds a cup for Parvati's milk. The image is nude and ornamented, and dates from 1100—1200 A. D. Its locality is not known. The three dancing images are dated to 1200—1300 A. D., 1300—1400 A. D. and 1500—1600 A. D. The oldest of them comes from Kiranur. In the case of these images the right hand keeps pointing (upwards) to Siva. The right leg is kept raised high and extended a little to the right. The left hand is extended to the left for balancing the body. The dancing forms wear *kiritas*.

The finds of Vaishnavite images are rather scanty as compared with the abundance of the same in respect of Saivite images. The Vaishnavite group in the gallery is small, but representative. It contains Vishnu and his consorts. Vishnu images of the Chola period are generally accompanied by both Shree Devi and Bhu Devi; and all the three of them are represented in the gallery.

Vishnu images are generally invariably associated with discs and conches in their back hands. This is true also of both the exhibits of Vishnus in the gallery. The back right hand holds a disc, and the back left a conch. The front right hand gives *abhaya*, while the front left rests on the mace. Both the images come from Rasipuram and are in the standing posture. One of them is dated 1100 A. D. and the other 1000 A. D. The older specimen is a little smaller than the later one.

Lakshmi, portrayed as Shree Devi, has a fully-bloomed lotus-flower in her left hand, and wears also a breast-band. It is dated 1000—1100 A. D. She is generally arranged on Vishnu's right, while Bhu Devi stands on his left. This image of Shree Devi is much smaller than that of Bhu Devi. It therefore goes perhaps with the smaller image of Vishnu of 1000 A. D. Its locality however is not known but may be believed to be Rasipuram.

Bhu Devi, the earth-goddess, is one of the two consorts of Vishnu's. She generally takes her place on Vishnu's left, and holds by her right hand a bud of the Blue Water-lily. She does not wear the breast-band. The image in the collection comes from Rasipuram and is dated 1100 A. D.

The Grama Devatha group displays good many figures and figurines. These pieces are commonly worshipped around village sites, and even in (nooks and corners of) large towns. They are said to stand sentinel on the site concerned. Madurai Veeran, for example, is believed to protect the site of Madurai.

Aiyanar is said to have established the cult of worship of Grama Devathas and is adored so much by the villagers who do not come within the fold of orthodox Hindus, as to have been included as one of the deities. He is generally represented as seated on an elephant-back.

Madurai Veeran is one of the chief deities worshipped as a Grama Devatha. He is shown in the collections, as standing on the ground, and also as seated on horse-back. He generally holds a shield in his left hand and a sword in the other. He is also believed to be a semi-historical personage as one of the generals under the Nayaks of Madurai.

Karuppar is the shortened term for Karuppannaswamy who is Madurai Veeran's attendant, and who is also worshipped as a Grama Devatha. He holds the bill-hook in the right hand. Some of his images hold a shield in the left hand.

The miscellaneous group of bronzes consist of thirty-nine objects mostly of deities, saints, animals, inanimates, etc.

Ganesas are of a few different kinds in the miscellaneous collection of bronzes. The standing Ganesa is a very small miniature form of the one already described, whereas the dancing Ganesa is of special interest. The figure is endowed with three pairs of arms, the front and the rear pairs holding goad, noose, broken tusk and cake of rice, as described for standing Ganesa elsewhere. The middle right hand perhaps holds one of Siva's emblems. The emblem however is missing. The middle left hand is extended to its full length to the left as if to balance the body which stands on the left foot while the right foot is raised and swung to the right.

In the miscellaneous collections can also be seen a few images of seated Ganapati (or Ganesa). All these are four-armed, the arms doing the same function as in the case of the standing Ganesa. The trunk in the case of two of these seated images, is coiled upwards on the right side, whereas in all other forms it touches the cake of rice. In one of the seated images, Ganapati's *vahana*, the musk rat, is also shown, on which the deity's foot rests.

Sun God on a seven-horsed chariot is another interesting piece in the miscellaneous collections. It is a typical illustration of the representa-

tion of the sun as personified in the Hindu legends and mythology. For more particulars, please vide Hindu Sculptures in Stone.



Fig. 31. NARASIMHA DISEMBOWELLING HIRANYAKASIPU, A SCULPTURE IN BRONZE. THE LATTER'S SON, PRAHLADA, IS SEEN STANDING IN DEVOTION.

Narasimha, a half-lion and half-human incarnation of Vishnu is shown disembowelling the demon, Hiranyakasipu, while Prahlada (the latter's son and the former's devotee) looks on in wonder and devotion. For more particulars, please vide Hindu Sculptures in Stone.

JAINA SCULPTURES

The Jaina Group of sculptures are arranged at the distal end of the corridors around the second open yard, and represent the Jaina vestiges of the past in the Pudukkottai area.

The Jaina saints, known as the Thirthankaras, are given the highest position in Jainism, and occupy a place which is superior to that of even gods and goddesses, many of whom are borrowed from the Hindu pantheon and depicted as waiting upon the Thirthankaras. The seated



**Fig. 32. THIRTHANKARA, A SCULPTURE IN STONE
(FROM MOSAKUDI).**

Thirthankaras generally resemble Buddhas, and are differentiated from the latter, by the following ornaments: (a) *swastika*, (b) mirror, (c) urn, (d) cane-seat, (e) a couple of small fish, (f) flower-garland and (g) book. Thirthankaras must have a *srivatsa* symbol on the chest, a tripple umbrella above the head, and a *lanhana* (or distinguishing symbol). The Jaina sculptures in the Museum are of both stone and bronze.

Jaina Sculptures In Stone

There is a stone image of Parsvanatha, a Thirthankara. He is recognised chiefly by the single-hooded serpent over his head. The image is in the standing posture with hands hanging straight down.

Mahavira is the twenty-fourth and the greatest of all the Thirthankaras. Majority of Jaina images in the Pudukkottai area are Mahaviras. A lion among the Jaina prophets, he rightly deserves his symbol which is a lion. All the Thirthankaras are generally portrayed as standing figures; but Mahavira is generally seen, however, as a seated figure in the *siddhasana* pose (i.e., with legs crossed in front). There is a stone image of Mahavira in the sitting posture. The head is however missing, but most other features are present. There is a triple umbrella above the place of the head. The Sala, his *kevala* tree, is also shown. This image belongs to 13-14th. century A. D. and comes from Vellanur.

Besides it, there are also small miniature imges of Mahavira, dating from 13th to 14th century A. D.

Jaina Sculptures In Bronze

There are five Jaina bronzes exhibited along with the stone sculptures. One of them is Adinatha or Rishabhadeva. The remaining four form a small but important group by themselves. They are dug up from the college site in the Pudukkottai Town. The most noted among them is a galaxy of all the twenty-four Thirthankaras arranged in a *thiruvachi*. At the centre of the frame, the nude Rishabhadeva (or Adinatha) stands on a lotus-pedestal, with his hands hanging straight down at the sides. He is the founder of the religion, and the first of the Thirthankaras. In Bhagavatha, Varaha, etc., he is considered as a Vaishnavite incarnation, but his symbol is a bull and his goal Kailasa. He is not connected with either Vaishnavism or Saivism. This exhibit portrays also all the remaining twenty-three Thirthankaras who are seen arranged as (relatively) miniatures on either side, and above the central figure, in the *thiruvachi*. The three remaing bronzes in the group are two standing Parsvanathas and one seated Thirthankara (probably Mahavira).

All the Jaina bronzes in the Museum belong to the 10th century A. D.



Fig. 33. ADINATHA WITH A THIRUVACHI CONTAINING ALL THE OTHER TWENTY-THREE THIRTHANKARAS, A SCULPTURE IN BRONZE.



Fig. 34. PARSVANATHAS (STANDING) AND MAHAVIRA (SITTING),
SCULPTURES IN BRONZE.

BUDDHIST SCULPTURES

Buddhist sculptures in the Museum are in marble. They are parts of a Buddhist *stupa* at Amaravati which is a small village in the Guntur district of the Andhra Pradesh. The earliest inscriptions of the place date from 200 B. C. Buddhist *stupas* are monuments raised over the remains such as hair, nails, teeth, bones, etc. of distinguished persons, and are worshipped in great reverence. The relics and their containers are usually kept in the centre of the *stupa*. The earliest *stupas* were very simple ones. *Stupas* of Asoka's period, were of brick and plaster and enclosed by a wooden rail with gate-ways. The wooden rail developed later on into one of stone slabs on an elaborate scale as found in the Amaravati *stupa*. The *stupa* gradually underwent a change. It increased in height and became ornamented with garlands carved in stone. In later years box-shaped constructions carrying umbrellas, developed above the *stupas*. This however did not persist for long. The umbrella became conventional ornamentations with unnatural curves. These details are all represented in bas-relief (marble) in the ruins of the Amaravati *stupa*. Some of the marble slabs dating from 127 to 250 A. D., which are presented by the Government Museum, Madras, and exhibited in the hall at the exit, give glimpses of Buddhist *stupas* and rails, customs and stories, etc. Only a few of the important exhibits of these sculptures are described below.

The Amaravati sculptures show in bas-relief, the conventionalised *stupas*. One such specimen is on exhibition in the gallery. A *stupa* was a simple cup-shaped structure, surrounded by a wooden railing. It facilitated easy garlanding, etc., in worship. Its importance grew and grew, and the wooden railings have developed into ones of stone, as at Sanchi, Bharhut and Amaravati.

The pillars (or *sthambas*) can generally be divided into three important parts: 1. base, 2. shaft and 3. capital. Sometimes the capitals are surmounted by pairs of animals. There is a model of such a capital with a pair of lions in the Museum. It is known as a lion capital. Over these capitals there may be also a throne with Dharma Chakra.

Standing Buddha is one of the carvings depicted in marbles. The head and the right hand are missing (on account of mutilation). The figure is robed; even the details of the folds of the robe are shown. The robe covers the body and the legs, goes over the left shoulder and leaves the right shoulder bare. The dress has close resemblance to that of the ancient Romans.

Buddha is generally worshipped symbolically. A pair of feet represents the entire person, and these are generally shown as in worship, in the sculptures.

The casing slabs contain the symbols of *trisulas* on wheels which were also in use in Mohenjo Daro and Lothal. They should have been used as symbols of fortune. They may also have a bearing on Saivite connections. They appear in rows on the casing slabs, a couple of chips from which are on exhibition.



Fig. 35. TRISULA FROM THE AMARAVATI STUPA,
A SCULPTURE IN MARBLE.

The rail pillars of the Amaravati *stupa* are decorated with lotus medallions. A couple of these medallions are also included in the exhibits.

The Amaravati *stupa* casing contained several designs, of which over-flowing vases were some. One such specimen on display, has the design of a richly-ornamented vase on a large slab. Lotus flowers, buds and fruits issue forth from the mouth of this vase. The minute details are rather erased or mutilated. In Buddhist sculptures such vases are seen in adoration.

A symbol of seated Buddha can be seen among the Amaravati sculptures in the Museum. It consists of a pair of feet, an empty throne, the Dharma Chakra on a pillar behind the throne, and a few ardent devotees. The Dharma Chakra represents the Wheel of Law (Buddha is its Turner). In the sculpture it symbolises Buddha's first sermon. Buddha's throne is worshipped as if it were Buddha himself.

In the sculptures wherever Buddha has to be shown seated, the throne alone is shown to represent him.

In the Buddhist collections there are also a number of small sculptures which must have been taken out of larger ones ; they indicate a few scenes from Buddha's life.

The hall at the exit contains besides all these exhibits, a number of photographic illustrations of the important ancient monuments and sculptures (which have not yet been collected) in the Pudukkottai area, as well as photographs of some of the important bronzes in the Government Museum, Madras.

TEMPLE ARCHITECTURE

Pudukkottai and its neighbourhood enjoy a geographically, almost central position in South India, and by this unique feature, have in them representations of all the important phases in the development of South Indian temple architecture. The period from 600 to 900 A. D. has set in motion the evolution of temples. The habit of construction of temples with perishable materials like wood, etc., that was prevalent before this period, was given up in favour of construction with stones. In the Pudukkottai Area the development of temple architecture can be traced from the seventh century A. D. onwards. In the Museum this subject is illustrated only by photographs, although carefully-prepared models have also been put on show. Some of the temples, the architecture of which has been explained in the Museum, are briefly described below.

The temple at Sittannavasal and the earliest portions of the temples at Kudumiyamalai and Thirugokarnam, which are as old as the seventh century, A. D., are rock-cut caves in the Pallava style. Some of the important features of this style are : The temple is hewn out of a large and massive rock and consists of a rectangular pillared hall with a small square *garbhagraham* which has a *dwarapalaka* in high relief on either side the entrance. The *dwarapalaka*-like figures may be even builders, donors, etc., connected with the temple. The pillars are seven feet tall and rectangular in section. The capitals are simple corbels or brackets. The ultimate *kudus* are spade-shaped. The *upapeetam* bears figures of lions' heads arranged in a row. The floor is a little higher than the ground level to which it is connected by a small flight of rock-cut steps.

The Sittannavasal cave-temple is represented in the gallery by a photograph (taken before its conservation work began) and a miniature model which very closely resembles the original and arrests the attention of many a visitor. The cave should have been cut in during the early period of the reign of King Mahendravarman I, when he was a Jain. The cave is in the Pallava style, and has Jaina figures in the carvings.

The cave is rich inside, in frescoes of the type seen at Ajanta and Sigiriya, photographic reproductions of which have already been referred to under the Pictures and Paintings Section.

The Kunnandar temple is another rock-cut cave-temple, but it belongs to the 8th century A. D. A photograph of a (Dwarapala or) devotee with folded arms, and sketches of plan and section of the temple constitute the series. Similarly photographs and sketches describe in the Museum, the Aintali temple (near Kodumbalur) which is not a cave-temple, but which is ascribed to the period, 8th to 9th century A. D.

From 850 A. D. to 1100 A. D. the temples assumed what is known as the Chola style. Some of the temples of this period in the Pudukkottai area, were built completely of stone from the basement to the top. The corbels of the earlier Chola temples are plain and bevelled, but in the later ones they have a central triangular projection resembling a tenon. The capitals are bulbous and have large abacus. The cornice is deep with a single convex curve. It is ornamented with *kudus*, the finales of which are trifoliate. Sometimes a row of *ganas* may be seen below the cornice. The *garbhagraham* is square except in the case of Vijayalaya Cholisvaram where-in it is round (although within a square *prakaram*). The *vimanam* is surrounded by a plain cupola. The use of bricks in the construction of the upper parts of the *vimanam* began about the later half of the Chola period. There are lions' heads arranged in a row on the *upapeetam*. Decorations on the *kalasam* and the *kumbam* are very simple. The niche-figures are in bas-relief in the older temples and in high relief in the later ones. The Siva temple at Kaliyapatti, the Agastisvara temple of the Panangudi village, and the Sundaresvara temple of the Tirukkattalai village are in the Chola style. They are of the 9th century A. D. Their photographs are exhibited in the galleries. Details of the Sundaresvara temple are also explained with sketches, showing the ground plan and section. It is followed by a photograph and sketch of the Balasubrahmanya temple of Kunnanur, which is also of the 9th century A. D.

The Muvar temple at Kodumbalur belongs to the 10th century A.D., and its details are clearly explained through charts and photographs, particularly of the central and southern shrines. In addition, there is a very beautiful plaster-of-Paris model (in miniature) of the central shrine of the Muvar temple, which stands a favourable comparison with the original in details, and which was prepared by the late Sri Venkatarangam Raju, a former Curator of the Museum. The history of this temple is interesting. There were three temples all in a single line, facing west. Each had an open *mantapam* in front. They were built by Bhuti Vikramakesarin in the 10th century A. D. The northern shrine has disappeared and only the remaining two are now seen. The sculptures

contained in them are excellent pieces of Chola art. This day, the *mantapams* have also disappeared owing to long neglect down the centuries.

In 1100 A. D. the Pandya style stepped into the field and held its sway till 1350 A. D. (when the Muslims invaded Madurai). It therefore became an intermediary between the Chola and the Vijayanagar styles. Bricks were put into use instead of stones, in the construction of the turrets of the Pandya temples. That is mostly the reason why the upper parts of many of these temples are now in ruins. The tenon-shaped triangular projection of the corbel becomes something like a pendent flower, while the sides are ornamented with designs of foliage. Other parts of the tops of pillars undergo similar elaborate changes in ornamentation. The abacus of the pillar is smaller than its counterpart in the Chola temples. Below it, is seen a new structure which is suggestive of lotus petals. At the junction of the shaft and the base of the pillar, conventionalised head of a serpent appears. The central *vimanam* above the *garbhagraham* becomes insignificant. The Pandya style of temples is illustrated with a sketch of the ground plan of the Siva temple of Tiruvidayapatti, which belongs to the period from the 13th to the 14th century A. D. The Pandya style is seen in a large number of temples in the Pudukkottai area, the chief of them being the Rajendra Cholisvaram at Ponnamaravati and the Siva temples at Tiruvarangulam and Kulathur. The Amman temples at Ponnamaravati, the Siva and Amman temples at Kudumiyamalai as well as some *mantapams* at Kudumiyamalai and Thirumayam belong to the 13th century A. D.

The pillars in the temples of the Vijayanagar period have their own peculiarities. The base is decorated. The rectangular bands are ornamented. There are also massive mono-lithic pillars with a profusion of sculptures but without the sculptured bulbous capitals. Many temples such as at Thirugokarnam, Kudumiyamalai, Thirumayam, etc., show chiefs, chieftains, donors, etc. in sculptures in the act of worship. These figures probably reproduce the contemporary costumes, ornaments, etc. of the period. During the period from the 14th to the 17th century A. D., *prakarams* and *mantapams* were added to the already-existing temples for facilitating the holding of elaborate festivals. Funds were forthcoming freely from the chiefs, merchants and citizens. The *mantapams* belong mostly to the Vijayanagar and Madura styles, the latter being merely a long corridor. Temples having this corridor are at Thirugokarnam, Thiruvengaivasal, Kudumiyamalai and Tiruvarangulam in the Pudukkottai area.

There are also photographs of pillared *mantapams*, etc. of a number of other temples (including those that are situated outside the Pudukkottai area), which are characteristic of the Vijayanagar style. A large number of them are exhibited on a six-leaved revolving frame-work.